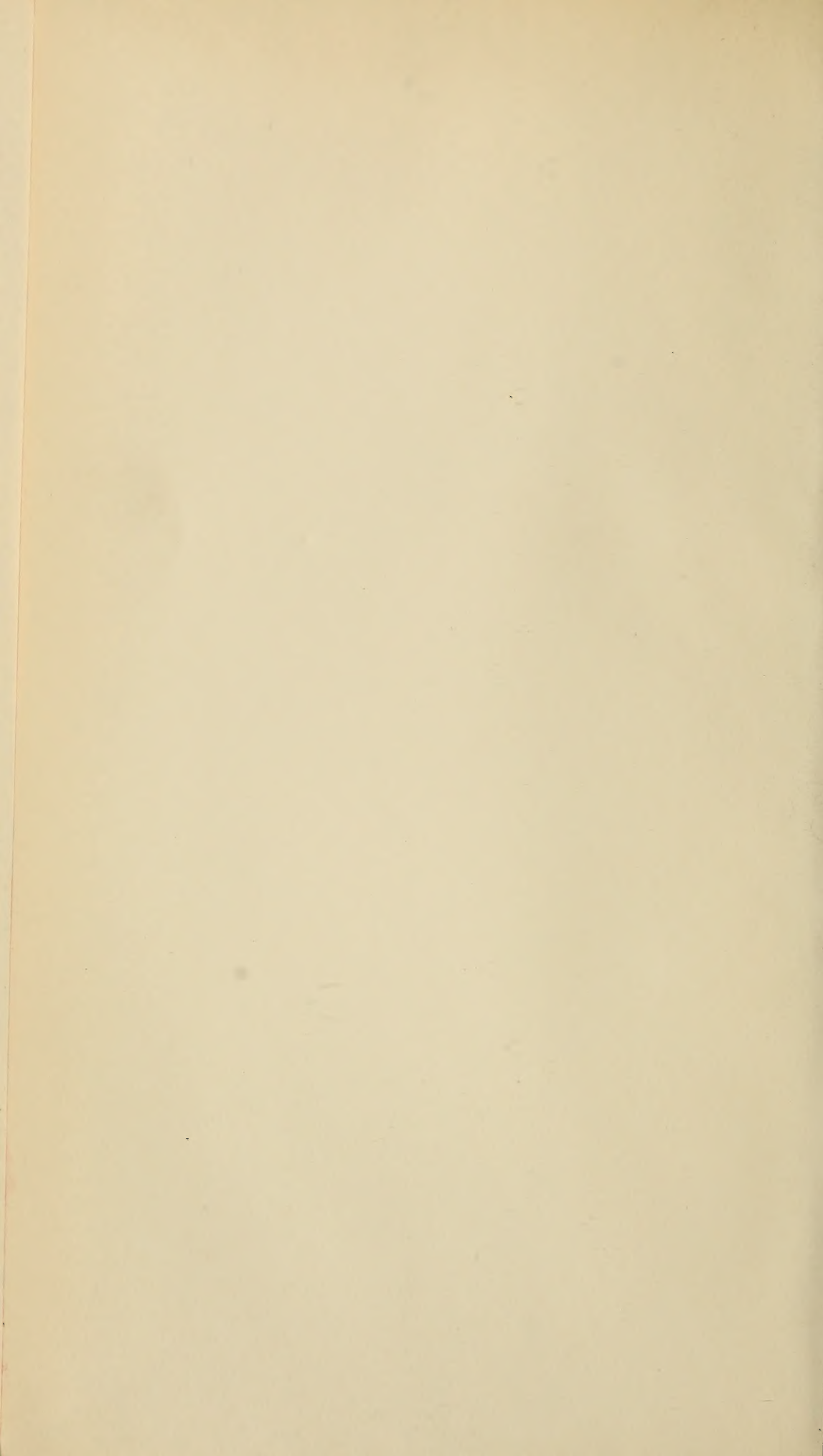


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University of the State of New York Bulletin

Entered as second-class matter August 2, 1913, at the Post Office at Albany, N. Y.,
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Published fortnightly

No. 589

ALBANY, N. Y.

APRIL 15, 1915

New York State Museum

JOHN M. CLARKE, Director
EPHRAIM PORTER FELT, State Entomologist

Museum Bulletin 175

29th REPORT OF THE STATE ENTOMOLOGIST

ON

INJURIOUS AND OTHER INSECTS

OF THE

STATE OF NEW YORK

1913

	PAGE	Injurious insects (<i>continued</i>)	PAGE
Introduction.....	5	Banded grape bug.....	41
Injurious insects.....	13	Use of miscible oils on trees.....	45
Codling moth.....	13	Larger sugar maples and miscible	
Lined corn borer.....	14	oils.....	45
European grain moth or wolf		Signs of oil injury.....	46
moth.....	16	Notes for the year.....	48
Rhododendron clear-wing.....	19	Fruit tree pests.....	49
Azalea leaf skeletonizer.....	21	Shade tree pests.....	56
Arbor vitae leaf miner.....	22	Forest tree pests.....	61
White grubs and June beetles....	24	Miscellaneous insects.....	64
Spotted hemlock borer.....	26	Publications of the entomologist..	68
White pine weevil.....	30	Additions to collections.....	72
Hickory bark borer.....	33	Appendix: A study of gall midges II	79
Pitted ambrosia beetle.....	36	Explanation of plates.....	212
Cactus midge.....	39	Index.....	247

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THE UNIVERSITY OF THE STATE OF NEW YORK

1915

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The University of the State of New York
Science Department, January 29, 1914

Doctor John H. Finley

President of the University

SIR: I have the honor to transmit herewith and to recommend for publication as a bulletin of the State Museum, the annual report of the State Entomologist for the year ending September 30, 1913.

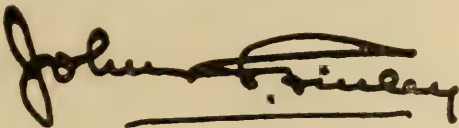
Very respectfully

JOHN M. CLARKE

Director

THE UNIVERSITY OF THE
STATE OF NEW YORK

Approved for publication this 8th day of May 1914

A handwritten signature in dark ink, appearing to read "John H. Finley". The signature is written in a cursive style with a prominent initial "J" and a long, sweeping underline.

President of the University

University of the State of New York Bulletin

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New York State Museum

JOHN M. CLARKE, Director

EPHRAIM PORTER FELT, State Entomologist

Museum Bulletin 175

29th REPORT OF THE STATE ENTOMOLOGIST 1913

Dr John M. Clarke, Director of the State Museum

I have the honor to present herewith my report on the injurious and other insects of the State of New York for the year ending September 30, 1913.

Two leaf feeders attracted general notice the past season, namely, the apple tent caterpillar and the allied forest tent caterpillar. The former, devouring the leaves of many orchard and wild cherry trees, was easily recognized by the large nests in the forks of the limbs. It was particularly injurious in the upper Hudson and Mohawk valleys. The latter pest, distinguished by the somewhat diamond-shaped, silvery white spots down the back, defoliated extensive areas of oak on Long Island, attacked the sugar maples in the upper Hudson valley and stripped poplars in the Adirondacks. The probabilities of such injuries were foreseen last year and timely warnings issued. A number of rare or particularly interesting species have been observed during the year, and brief notes concerning a number of them are given in the body of the report.

Petroleum compounds as insecticides. The serious condition of many sugar maples, following the application of miscible oils in 1911 and similar trouble in several apple orchards in 1912, was followed up the past season by studies of some cases, which, in connection with certain experiments, have resulted in confirming our opinion as to the cause of the trouble. This is a matter of much practical importance, since the injudicious use of these materials may jeopardize the existence of hundreds of valuable shade or fruit trees. The details of this work are given on subsequent pages.

Fruit tree pests. The studies and experiments of the last four years on the codling moth were continued. Some fruit growers became apprehensive in midsummer of severe injury by larvae of the second brood. Examinations by the Entomologist failed to disclose a substantial basis for such fears, and this opinion was confirmed in October by observations made in the orchards of Messrs W. H. Hart of Arlington and Edward Van Alstyne of Kinderhook. These persons sprayed under strictly commercial conditions and with no expectations that the trees would be subjected to a test later. There was a good crop and it was found that from about 95 to 97 per cent of the entire yield was worm-free as a result of one timely spraying.

A small parasite has been exceedingly abundant and widely distributed in orchards infested by San José scale, and in not a few instances has been an important factor in reducing the numbers of the pest. Observations in typical sections show that in most cases the trees in unsprayed orchards were seriously injured in earlier years and, as a rule, we believe that fruit growers must continue to rely upon applications of lime-sulphur washes for the control of this pernicious enemy.

Injuries by red bugs, *Heterocordylus malinus* and *Lygidea mendax*, two very similar appearing species which are known to occur in New York, were so abundant in one orchard near Poughkeepsie that they deformed about one-third of a large crop of greenings. A brief account of this outbreak is given in this report.

The work of the pear thrips, *Euthrips pyri*, one of the newer fruit pests, was studied in the vicinity of Athens, and a marked localization of injury observed as in earlier years. A detailed account of this insect was given in our report for 1912.

The pear psylla is a pest of considerable importance, especially in the western part of the State, and occasionally very injurious in the Hudson valley. Incidentally, the practical value of late spring applications of a lime-sulphur wash for the control of this insect was demonstrated in a badly infested orchard near Athens.

A new grape enemy, *Paracalocoris scrupeus*, which may become of considerable importance to growers in the Niagara section, in particular, has been discovered. It may be known as the banded grape bug. Its work is described and a discussion of its habits and the best methods of control are given on subsequent pages.

A number of other insect pests of fruits have been studied and records concerning them are given in a series of classified notes.

Gipsy moth. The small colony of the gipsy moth, discovered last year, appears to have been completely exterminated. This occurrence proves, in a concrete manner, the danger of the insect becoming established in New York territory, and amply justifies the maintenance of rigid precautions to prevent this. Evergreens and shrubbery grown in sections where gipsy moth is known to occur should be examined most carefully, especially in the case of evergreens. The presence of broken egg masses usually means the occurrence of living eggs in the packing material or about the roots of the plants in the same bale or box, and a due regard for the public welfare necessitates the destruction of the shipment or the part of the shipment exposed to infestation of this character.

Brown-tail moth. There is little to report concerning the brown-tail moth, though the danger of its establishing itself in the State has not decreased. It is only a question of time before this occurs. The winter nests are so characteristic that there should be little difficulty in recognizing the pest and at the outset preventing its becoming extremely abundant.

Grass and grain pests. The white grub outbreak of last year has largely abated, partly at least as a result of various natural causes. The studies of last year have been continued. The most interesting development was the discovery of many large beneficial maggots of *Promachus fitchii* O. S. They were abundant in fields badly infested by white grubs the preceding year, and at the time of observation last spring, nearly free from the pests.

A rare or usually overlooked corn pest, the lined corn borer, *Hadena fractilinea*, was destructive in Ulster county fields. A full discussion of this relatively new insect is given in the body of the report.

The discovery of the European wolf or grain moth, *Tinea granella*, in a local seed warehouse adds another to the list of important grain insects. A careful study has been made of this insect and a detailed discussion appears elsewhere.

Shade tree insects. Observations show that the comparative immunity from severe injury by the elm leaf beetle the past season is probably due to the exceptionally cool weather in June, a time when the laying of eggs by this pest is at its height and the period when adverse climatic conditions might be expected to exert a maximum influence. There have been some cases of very severe

injury locally here and there, due probably to a decreased vitality of the trees and a speedy destruction of the abnormally small leafage. It is undoubtedly true that the more thorough spraying by certain communities during the last few years has been most beneficial. The apparent check of the past season is presumably temporary and any extended reliance thereupon is inadvisable.

The false maple scale (*Phenacoccus acericola*) has been the cause of a number of complaints, though it has been distinctly less numerous than in recent years. It was extremely abundant during late summer in one locality at Mount Vernon.

The tulip tree scale, *Toumeyella liriiodendri*, a pest occasionally numerous, was unusually injurious in the vicinity of New York City. Several natural enemies were noted preying upon this species.

Forest pests. Work has been continued upon the hickory bark beetle, *Eccoptogaster quadrispinosa*, and field observations by the Entomologist lead him to believe that the period of severe injury for the vicinity of New York City has largely passed. His investigations of previous years and the studies of this season indicate the practicability of protecting the more valued trees by applications made shortly after the beetles have entered the bark. The probable efficacy of this treatment by no means lessens the advisability of cutting and burning badly infested wood before the borers can mature and escape.

The extensive plantings of white pine in recent years have given the white pine weevil (*Pissodes strobi*) almost ideal opportunities for multiplication and, as a consequence, there have been numerous complaints regarding the work of this insect. The Entomologist, in cooperation with Mr Waldo C. Johnston of Cooperstown, conducted a practical test of the value of collecting the weevils by hand. It was found that four collections could be made for about \$1.25 an acre where the trees were three feet high or less and, as a result, no weevils were to be seen later. There are reasons for believing this to be a practical and possibly a profitable method of controlling the pest in such plantings. It is planned to continue the investigations of this important pest.

Original studies were also made of the spotted hemlock borer, *Melanophila fulvoguttata*, an insect which destroyed several hundred valuable hemlocks in the New York Botanical Gardens, and one which has killed many trees in the Appalachian region. A detailed account of this borer is given in the body of the report.

The rhododendron clear-wing (*Sesia rhododendri*) and the pitted Ambrosia beetle (*Corthylus punctatissimus*) were also studied. The first deforms and weakens the valuable rhododendron, while the latter may destroy a considerable proportion of one or more beds of this shrub.

The work of the two-lined chestnut borer, *Agilus bilineatus*, a pernicious enemy of both chestnut and oak, was observed in several localities about New York City and appropriate recommendations made. A detailed account of this pest has been given in New York State Museum Memoir 8.

The Entomologist has taken advantage of the recent outbreak by bark beetles, to study the general conditions which may result in serious injury by these borers. A careful examination of weather records, especially those relating to precipitation, tends to support the belief that a series of annual droughts may so weaken the trees as to produce conditions very favorable for the multiplication of the borers. A discussion of the data is given in connection with an account of the hickory bark beetle.

Flies and mosquitos. The interest in the control of the house fly and the subjection of the mosquito has continued. The Entomologist sent out several warning notices early in the year and prepared a brief folder concerning the house fly, which was widely circulated in early summer. He has also participated in several public meetings called for the purpose of arousing interest in the control of both flies and mosquitos.

Gall midges. Studies in this group (*Itonididae*) have been continued and a number of species and three new genera described. The practical character of this work is illustrated by the description of one midge which is considered a most important natural enemy in controlling the red spider on cotton, and a consultation with Prof. Henry Tryon of the Prickly Pear (traveling) Commission respecting the introduction of certain gall midges into Queensland, in the expectation that they might become important agents in practically freeing large areas from the introduced and obnoxious prickly pear. This report contains a detailed account of a Cactus midge, *Itonida opuntiae*, which may prove of great value in Australia, though regarded as a pest under certain conditions in this country. The rose midge, *Dasyneura rhodophaga*, an important enemy of the rose grower, has caused considerable apprehension in the vicinity of Rochester on account of its injuries to young plants.

Lectures. The Entomologist has delivered a number of lectures upon insects, mostly economic forms, before various agricultural and horticultural gatherings, some of them being in cooperation with the Bureau of Farmers Institutes. Several lectures have also been given under the auspices of local improvement associations.

Publications. A number of brief popular accounts regarding such common pests as the house fly, apple tent caterpillar and forest tent caterpillar have been widely circulated through the press. The more important publications, aside from the report of last year, are: *The Gall Midge Fauna of Western North America*; *Studies in Itonididae* and several papers describing new species of gall midges.

Removal. The moving of the collections and their establishment in the new quarters in the Education Building involved a large amount of work, which necessarily restricted activities along other lines and must continue so to do until the insects are permanently rearranged. The removal was accomplished with practically no breakage or loss of either specimens or equipment and with comparatively little hindrance to the regular office routine.

Faunal studies. This phase of entomology has received some attention almost from the establishment of the office and has an important bearing upon practical work, since data of this character make possible the fixing of boundaries beyond which there is little probability of injurious species maintaining themselves in numbers. Earlier unpublished studies have resulted in the Entomologist fixing approximate boundaries for the various life zones in the State. It has been his policy for some years to collect in representative areas whenever opportunity offered and much valuable material has been secured in this manner. Collections in the Adirondacks, begun by the late Dr J. A. Lintner, have been continued. The past summer the Entomologist collected in several Adirondack localities, spending four days on or near Mount Marcy, while Assistant State Entomologist Young continued his studies of the fauna at Wells. These data are now being prepared for publication.

Collections. A special effort has been made the past season to secure specimens of the work and early stages of various injurious forms, since biological material is a most important component of economic collections and indispensable in elucidating the habits and life histories of the various species. The State collection now contains a large amount of such material, invaluable because of the associated data. Many microscopic preparations of smaller insects

have been made and incorporated in the collections as in earlier years.

Much labor has been expended upon the rearrangement of the collections, an undertaking which has been hampered to some extent by insufficient case or tray room. This work, while time-consuming and in a certain measure unproductive, is a necessary preliminary to effective studies in the future, otherwise more time would be lost in endeavoring to find misplaced specimens than would be required to put the collection in order in the first place.

Material provision for the care of the collections is essential. The pinned insects are in boxes or trays in wooden cases. There are not enough of the former to permit the specimens being properly arranged, and the latter should be replaced by steel cases and more provided to accommodate the additional boxes and trays required. The biological material is in an even less satisfactory state. It is in shallow, wooden trays and difficult of access because of the lack of space. There is need of a modern series of metallic trays for the accommodation of such specimens. Some equally satisfactory provision should be made for the large collection of microscopic slides, many of them containing types of species, and therefore impossible of duplication. The constantly increasing collection of photographic negatives requires a metallic filing case of approved design.

Nursery inspection. The nursery inspection work conducted by the State Department of Agriculture has resulted in the Entomologist being required to make numerous identifications and also advise in regard to the policy which should be pursued by the State. Many of the specimens submitted for name were in poor condition, and as they may represent any stage in insect development and frequently originate in a foreign country, such determinations are laborious and require for their successful prosecution a large collection and many entomological works, both domestic and foreign. The correct identification of such material is very important, since the disposal of large shipments of nursery stock depends in considerable measure upon the character of the infestation.

Miscellaneous. Cooperation with the Division of Visual Instruction has been continued and additions made to an excellent and somewhat extended series of photographs, mostly of injurious or common insects or their work.

General. The work of the office has been materially aided, as in past years, by the identification of a number of species through the

courtesy of Dr L. O. Howard, chief of the bureau of entomology, United States Department of Agriculture, and his associates. Several correspondents have assisted by securing valuable specimens, and many have rendered efficient service by transmitting local data respecting various insects. It is a pleasure to note that there has been, as in the past, a most helpful cooperation on the part of all interested in the work of the office.

Respectfully submitted

EPHRAIM PORTER FELT

State Entomologist

October 15, 1913

INJURIOUS INSECTS

CODLING MOTH

Carpocapsa pomonella Linn.

Observations the past season, in continuation of the preceding four years' work with the codling moth, show the efficacy in the Hudson valley of one thorough, timely spraying under normal crop conditions. The tabulation of the results for 1909-12 inclusive, demonstrates the possibility of obtaining over 97.5 per cent of worm-free fruit as a result of one such application.

There appears to be doubt in some quarters as to the feasibility of this method, and for this reason the work has been continued to the extent of keeping watch upon subsequent developments. The same orchards were kept under observation, and on examining the fruit last fall it was estimated that Mr W. H. Hart had obtained in his Titusville orchard, between 97 and 99 per cent of worm-free apples on both Baldwins and northern spys. The orchard contains about 1600 trees and this year will average about 4 barrels a tree. It has been the owner's practice to spray but once a season for the codling moth, which has been the rule for the last five years at least, aside from a few experimental plots in 1909 and 1910. Repeated tests in earlier years show that under the same conditions unsprayed or check trees would have 25 per cent or more wormy apples. This limited amount of spraying not only prevented injury by the codling moth, but checked most other insect pests and controlled whatever fungous diseases may have been present. The apples were large in size, smooth, and of excellent color, while the foliage remained vigorous until the end of the season.

Similar observations in the orchard of Mr Edward Van Alstyne showed a very satisfactory condition, the trees which had been sprayed but once producing 95 per cent or more of worm-free apples, while two rows which received a second treatment in early August for the late brood of apple worms, yielded about 97 per cent nonwormy fruit. In size, smoothness and color, little could be desired, while the trees are in a thoroughly vigorous condition.

The important point in the case of these two orchards is that it has been the practice during recent years to spray but once annually for the codling moth and that, as a result of this minimum treatment, the pest has been controlled very satisfactorily and, if anything, conditions have improved from year to year. The work in

each instance was practical in nature. There was no special effort to establish a record, and during the last two years there has been no supervision of the spraying by an entomologist. Both of these orchards are in excellent horticultural condition, though they have received no more treatment in the way of spraying, cultivation and fertilization than their owners considered practical from a financial standpoint. Special effort may be justified when attempting to rehabilitate a run-down orchard; after this has been accomplished the important point is to produce the most desirable results at the minimum expense without incurring undue risk. It is our opinion, so far as the codling moth is concerned, that the one timely spraying with a poison just as soon as possible after the dropping of the blossoms and certainly within ten days of that time, will meet all normal requirements in the Hudson valley.

The data upon which the above conclusions are based have been given in detail in the author's reports for the years 1909-12, inclusive.

LINED CORN BORER

Hadena fractilinea Grote

The yellowish, dull brown-striped caterpillars of the lined corn borer, a comparatively unknown pest, were received from Mr C. B. Schoonmaker, Stone Ridge, Ulster county, under date of June 13th. They were accompanied by a statement to the effect that they were destroying his field corn and that of a neighbor by boring into the heart and killing the stalks. The larva lives upon the tender, small shoots, tunneling the stalks and giving evidence of its presence by making irregular holes in the growing tip. Its manner of work suggests that of a stalk borer.

Studies of this species by Prof. F. M. Webster in 1894 showed that the caterpillar entered the stem at the tip and worked downward, while another related species, *H. stipata* Morr., begins just above the roots and works upward. Professor Webster also reared another allied form, *H. misera* Grote, from the caterpillars working in the corn. He was unable to separate the two species in the larval stage and has the impression that the caterpillar of *H. stipata* Morr. closely resembles that of *H. fractilinea*.

Description. The adult is one of the smaller of the familiar heavy-bodied, owlet or Noctuid moths with a wing spread of nearly $1\frac{1}{4}$ inches, a variable purplish brown color, and has on the fore wing a silvery, eyelike spot near the middle and a more or less distinct, irregular, brownish yellow, subapical, oblique band, which

latter is continued along the posterior margin to the basal third and there expands into a conspicuous, ovoid area.

The larva, described in considerable detail by Professor Webster, may not be that of this species, particularly as it is somewhat larger (26 mm) than those from which our material was reared, the latter producing only *H. fractilinea*.

Larva. Length 1.8 cm. Head and thoracic shield mostly pale yellowish. Body mostly a light fuscous yellowish with dull brown, rather broad submedian lines and a narrower, dark brown lateral line slightly broken at the incisures; suranal plate mostly fuscous yellowish, irregularly margined posteriorly with brownish; venter yellowish transparent; mouth parts and eyes light brown.

Life history. Comparatively little is known. The larva may be observed in June feeding on corn, becoming full grown probably the latter part of that month, the moths appearing in our breeding cages July 19th to 21st. Professor Webster obtained them somewhat later, namely, from the last days of July to August 10th. The injury last season was on land which had been plowed the preceding fall, and there is at least a fair probability that the caterpillars winter in the sod much as do those of a number of other Noctuids as well as larvae of Crambids. When the presumably natural food, grass, is destroyed these caterpillars are compelled to eat whatever may be available and, under the conditions outlined above, may seriously injure corn.

Distribution. This species has a wide range, having been recorded by the late Doctor Smith from both Canada and New York in August, Illinois, Vermont, Wisconsin, Nebraska, Colorado and New Mexico. Doctor Holland states that this species is not scarce in the Appalachian subregion.

Preventive measures. Injuries by this insect as well as by allied cutworms and the frequently associated grass webworms, is best prevented by midsummer or early fall plowing (the earlier the better the protection) of grass lands which are to be planted to corn the following season. Doctor Forbes recommends, in addition to the above, pasturing pigs on grass or clover lands to be plowed for corn, distributing by the aid of a seed drill, a line of dry bran or middlings poisoned with Paris green at the rate of 1 pound to 30 pounds of bran, or scattering poisoned food in the spring along the borders of the cornfields next to the grass. It should be unnecessary to add that the use of poisoned baits should be restricted to places where there is no danger of destroying domestic animals. Attacks by this class of pests can also be avoided by arranging the rotation, when possible, so that corn will not follow

grass. Planting more than the usual amount of seed may be justified in certain cases, since this procedure might enable the farmer to secure a fair stand in spite of considerable injury.

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EUROPEAN GRAIN MOTH OR WOLF MOTH

Tinea granella Linn.

The discovery of the European grain moth in a local seed warehouse adds another to the list of important cereal pests. This moth



Fig. 1 European grain moth (enlarged, original)

is regarded in England as a most serious enemy of stored grains, and according to Barrett, it may swarm to such an extent near grain warehouses as to excite popular wonder. It certainly produced a bad condition of affairs at Albany in stored sweet corn, reducing the value of hundreds of bushels from \$5 to 50 cents.

Historical. This pest was discussed by Harris in 1841, though with no positive statement as to its occurrence in America. Glover studied this insect or one with similar habits in 1854. Chittenden is of the opinion that the species mentioned by Glover is *Batrachedra rileyi* Wals. It was recorded as being on the wing by Clemens in 1859 and described as *T. variatella*. Packard, in 1877, classes it as an European importation. In the estimation of Chittenden, none of the above records are free from suspicion of one kind or another. Britton, in 1906, records this insect from Connecticut and states, on the authority of Doctor Howard, that it is known to occur in Canada and Michigan. It is probably distributed throughout the northwestern states.

Description. The moth is a grayish, irregularly dark brown spotted insect having a wing spread of about one-half inch. The coloration is quite variable, though the specimens present a fairly characteristic appearance.

Larva. Length 7 mm. Head reddish brown, the body moderately stout, yellowish white and with sparse pale setae; the true legs and prolegs concolorous with the body.

Cocoon masses. A most characteristic feature of injury by this pest is the peculiar masses of cocoons and frass in the vicinity of infested grain. These masses are about half an inch wide and from three-fourths of an inch to two or three inches in length, irregularly oval and a dull reddish brown color. They are composed of groups of cocoons, the meshes of the latter loosely filled

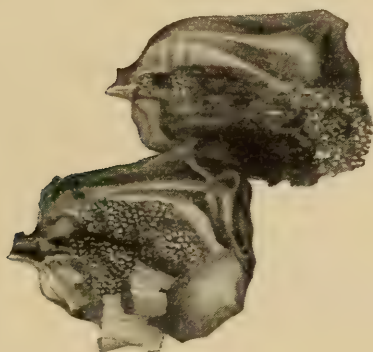


Fig. 2 Kernels of corn eaten by European grain moth (enlarged, original)



Fig. 3 Cocoon masses and exuviae of European grain moth (enlarged, original)

with brownish, gnawed particles. The light brown pupae, prior to the disclosure of the adult, work about half way out of the masses, and one may frequently see such a mass with ten to fifteen or twenty pupal cases. The groups of cocoons may be so abundant as fairly to plaster considerable areas of adjacent walls.

Life history and habits. This insect is generally credited in Europe with producing two broods annually. The females are said to deposit thirty or more eggs on various grains, the young caterpillars entering the kernels and, in the case of corn, displaying a marked preference for the softer and more nutritious germ. The individual caterpillars may attack several grains and seriously injure or spoil as many as twenty. On attaining maturity they forsake the grain, spin cocoons in masses as described above, and, in the case

of the fall brood, winter in such retreats, the moths appearing in early spring.

An examination of conditions in Albany in May 1913 resulted in our finding a number of larvae, both naked and in cases, and numerous recent cocoons on the outside of bags containing seed corn and within the bags, kernels with webbed particles of chewed grain attached thereto, were numerous. These conditions prevailed in a seed warehouse where there was no provision for heating during the winter. At the time of our visit there were thousands of moths upon the walls of the storeroom, two or three frequently within an inch of each other. On one wall there were many of the characteristic cocoon masses described above. Hosts of adults were obtained from material collected at this time, May 20th and 21st, a few issuing as late as June 20th. Attempts to rear the insect were unsuccessful and it was therefore impossible to ascertain the time necessary for the production of a generation, though it would seem probable that breeding might be continuous throughout warm weather wherever conditions were favorable.

Food habits. This insect has been recorded as infesting all kinds of cereal grain, such as wheat, rye, oats and barley. There are records of its having been reared from dried fruits and woody fungus. Kearfott, in Smith's *List of New Jersey Insects*, records obtaining the moths from larvae in tulip and crocus bulbs. Adults apparently indistinguishable from this grain pest have been reared by us from mushrooms.

Distribution. This species is with little question a cosmopolitan form and is likely to appear wherever grain is shipped or handled in quantities, especially if it be stored at moderate temperatures for a considerable period. It has been recorded in literature from western-central Europe, northern Persia and Japan, North Africa, Australia and North America.

Control measures. This species, like other cereal pests, is more likely to cause trouble in warehouses or other places where grains are held at moderate temperatures for extended periods. Seed houses are particularly liable to infestation if stock is carried over from season to season. The most obvious remedy is to avoid holding grains and seeds liable to attack, longer than necessary. This should be supplemented by care in cleaning out crevices or preventing the accumulation of grains in situations where the moths can breed unchecked. These measures should ordinarily suffice. Occasionally it may be necessary to resort to fumigation with either

carbon bisulphid or hydrocyanic acid gas. A badly infested building might require several treatments, and owing to the habits of the pest, it is obvious that not much reliance can be placed upon fumigating the infested grain itself, since the insects leave it in large quantities prior to changing to the moth. It may, in some instances, be necessary to provide nearly gas-tight rooms for the storage of grain, so that in cases of serious infestation the apartment and its contents can be easily and safely fumigated. Another method of obtaining the same end is by making provision for heating storage quarters to a temperature of 120 degrees and holding it there for at least 30 minutes. This has been tried on an extensive scale in flour mills with very satisfactory results. It is perhaps needless to add that the resistance of seeds to this treatment should be carefully ascertained before the method is extensively used in seed warehouses.

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RHODODENDRON CLEAR-WING

Sesia rhododendri Beutm.

Wilting or yellow rhododendron leaves are signs which may indicate the work of the whitish caterpillar of this species, particularly if the evidences of injury are confined to a branch or portion of a stem. This borer limits its operations largely to stems or branches a foot or more above the ground. It appears to be generally distributed in the New York Zoological Park as shown by specimens forwarded by Mr Herman W. Merkel, and Mr G. P. Engelhardt of the Children's Museum informs us that it is common in and about Prospect Park, Brooklyn. The species has also been recorded from Cheltenham, Pa., and, according to its describer, is closely allied to *S. pyri* Harr. and *S. scitula* Harr.

Habits and life history. The young larva frequently works just under the bark and in the sapwood, excavating an irregular, longitudinal, more or less frass-filled gallery some 3 inches in length and terminating in an irregular, oval, sparsely silk lined cell about three-eighths of an inch long where the insect evidently hibernates. This borer shows a marked tendency to excavate one or two broad, short,

transverse galleries, possibly designed to girdle the infested twig partly and thus reduce its vitality.

This species has been studied by Mr Engelhardt, who has kindly placed at our disposal the following notes respecting its life history. The moths begin to emerge during the last week of May but more generally appear during the first half of June. Eggs are deposited singly on small twigs, though on the trunks and branches of large plants they occur in numbers in close proximity. The larva at first attacks the inner bark, working gradually through the cambium

layer into the sapwood, forming irregular galleries 1 to 2 inches in extent. Late in August the young larva is about one-half grown, and the last of October many may be full size. The larva remains dormant within its gallery during the winter and early in the spring begins to prepare a place for pupation. This consists of a tunnel reaching from a lower chamber in the sapwood, up through the outer bark, leaving a thin, circular layer at the opening through which the imago can easily escape. The larva incloses itself in its lower chamber within a slight cocoon composed of small chips of wood and silk. The change to the pupa takes place in May, this stage lasting about fifteen days.

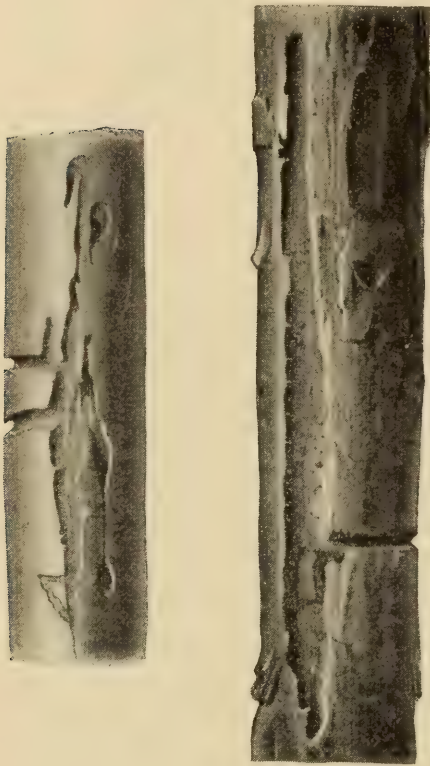


Fig. 4 Work of rhododendron clear-wing borer in stems (natural size, original)

resistant, but on account of the preference of the insect for places previously attacked, the injury increases from year to year and eventually results in death. Large plants show ugly scars on the trunk and branches. These may be either devoid of bark or loosely covered with dead and perforated pieces. There may also be more or less fine, yellow, granular, not powdery borings thrown out by the caterpillars. The plants are rarely injured within one foot of the ground.

Young plants or small twigs are frequently girdled and soon wilt and die. Larger stems are more

Mountain laurel and azalea are also attacked, though according to the observations of Mr Engelhardt only when they grow with rhododendrons.

This insect is subject to attack by a parasitic wasp, apparently a species of *Macrocentrus* which Mr Engelhardt reared from infested branches. The downy woodpecker destroys many of the larvae, though not without inflicting deep wounds which may result in more injury than that caused by the operations of the insect.

Description. Larva, partly grown. Length 8 mm, diameter 1.3 mm. Head yellowish red, the anterior portion and the mouth parts a variable reddish brown. Antennae biarticulate, light reddish brown; eye spots dark brown. Thoracic shield semitransparent. The body sparsely and finely haired, smooth, and mostly whitish transparent, except for the reddish brown intestinal contents; terminal segment yellowish transparent and bearing a series of moderately stout, yellowish brown hairs; true legs yellowish brown; prolegs on segments 3 to 6 whitish transparent, the hooklets light brown, the anal pair apparently rudimentary.

Control measures. The most effective method of controlling this insect is to prune out thoroughly and burn all dead or infested portions of bushes during the winter or fall. If it is desirable to preserve large plants, Mr Engelhardt suggests first scraping the injured portions and then applying a coat of thick tar paint, one application in the fall as a repellent to woodpeckers, and another in the spring, preferably in late April or early May, to prevent the emergence of the moths.

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AZALEA LEAF SKELETONIZER

Gracilaria azaleae Busck

1914 **Busck, August.** Insec. Inscit. Menstr. 2:1-2.

Several complaints were received during the winter of 1911 from men interested in greenhouses in Yonkers and Rochester, to the effect that azaleas were being seriously injured by a small caterpillar. Mr August Busck of the United States National Museum, a specialist in the Microlepidoptera, concluded that the species was not of European origin but represented a new American form.

Life history and habits. The small, yellowish, nearly full-grown caterpillars only about one-fourth of an inch long, usually turn over the tip of an azalea leaf, webbing it down with fine, silken strands

and eating away the tissues of the infolding under side. The injured portion turns dry and the retreat contains numerous small, black particles of frass. The young larvae are probably miners in the leaf. The whitish, silken cocoons in which the final transformations occur, are frequently made on the leaves close to the affected area, though an occasional cocoon is spun under the partly rolled leaf tip. Moths were reared March 25, 1912 and, judging from reports received from various persons, it is probable that breeding may be more or less continuous under the usual greenhouse conditions.

Description. The parent insect is a delicate moth with a wing spread of only about three-eighths of an inch. The forewings are yellowish, with large, purplish areas and a series of purplish dots along the costal margin of the broad, yellowish portion. The hind wings are slender, light pearly gray and long-fringed. This species, according to Mr Busck, is allied to *G. violacella* Clem.

Larva. Length, one-fourth of an inch. Head unusually large, depressed, yellowish, the mouth parts well developed and the eyes apparently represented by a large, circular, brown spot. Thoracic legs well developed. Thorax yellowish and with the region just above each leg marked by several distinct swellings. Abdomen apodal, yellowish, and with a distinct though irregular fuscous band on the penultimate segment.

Cocoon. This is nearly one-fourth of an inch long, about three-thirty-seconds of an inch in diameter and faintly suggests the familiar *Bucculatrix* cocoon, though there are no distinct longitudinal ribs. It is a well-defined, thin, silken structure usually lying longitudinally on the under side of the leaf and frequently covering more or less of the mined area.

Remedial measures. Treatment with tobacco preparations, either by fumigation or spraying, appears to be a very effective method of controlling this insect, since practically no caterpillars were to be found in greenhouses after such treatment. It is not known whether spraying or fumigation gave the best results.

ARBOR VITAE LEAF MINER

Argyresthia thuiella Packard

The small caterpillar of the arbor vitae leaf miner limits its operations largely to mining the terminal sprays of arbor vitae foliage and causing the latter to turn brown. There is, as a rule,

more disfiguration than damage, since there is generally only a small portion of the foliage involved.

Habits and life history. Early last June our attention was called to the work of this insect (kindly determined by Mr W. D. Kearfott) by Mr Henry Hicks, Westbury, N. Y., because of its being so numerous that the browned, mined leaves rendered many ornamental arbor vitae unsightly and therefore unsatisfactory. Occasionally this insect may become so abundant as to affect a considerable proportion of the foliage and give infested trees a rusty, brown appearance. The

operations of the pest are usually confined to a terminal half inch of leaves here and there, and sometimes its work is so restricted as to involve only one-half of a portion of the leaflet. Transformation to the pupa occurs in the mine, the moth emerging therefrom about the middle of June, the dates in our rearings ranging from the 9th to the 17th. There seems to be an erroneous association by Packard of this adult with a cocoon and, with this in mind, there may be a question as to his having described the true larva of this species. Kearfott¹ states of a closely allied species, *Recurvaria thujaella* Kear., that the eggs are deposited in the summer, the young

larvae begin mining the leaves of the preceding year and eventually transform within the mines, the moths appearing in June. We found nearly full-grown larvae next to the green portion of browned leaflets October 14th and have reared this species from the leaves of *Juniperus utahensis*, kindly forwarded by Prof. E. Bethel of Denver, Col. This is probably a fairly correct outline of the life history of the species under consideration. *A. thuiella* has also been reared, we are informed by Mr Kearfott, by the late Professor Slingerland. A parasite, *Pentocnemus bucculatricis* How., kindly determined by Messrs Howard and Crawford, was reared from leaves infested by this leaf miner.



Fig. 5 Spray of arbor-vitae showing tips injured by the leaf miner (natural size, original)

¹ 1903, N. Y. Ent. Soc. Jour., 11:154-55.

Larva. Length 2.5 mm. Head a variable yellowish and dark brown, mostly the latter, the mouth parts yellowish brown. Thoracic shield pale brownish yellow with an irregular, quadrate, median area a variable dark brown. Body smooth, a nearly uniform yellowish white, the anal shield fuscous yellowish, with irregular, dark brown areas on the median line anteriorly and sublaterally posteriorly. Moderately long, sparse, whitish hairs occur on both the head and body. True legs and prolegs pale yellowish, the hooks of the latter yellowish brown.

Described from living caterpillars October 14, 1913.

Remedial measures. The cutting off and burning of the infested leaves during fall or early spring would undoubtedly result in destroying many of the pests and, if persistently followed up, might prove the most satisfactory method of controlling the insect. It is very possible that thorough spraying with a contact insecticide, such as black leaf 40 (diluted approximately 1 to 800) to which soap has been added to increase its adhesiveness, would prove effective if the application were made early in July for the purpose of destroying the young caterpillars before they are well sheltered by the leaf tissues.

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WHITE GRUBS AND JUNE BEETLES

The extensive injury of last year by white grubs was followed by a considerable disappearance of the pests last spring, due in part, at least, to the activity of natural enemies and the influence of other adverse factors. It would appear from conditions as they now exist that comparatively few white grubs will be found in the soil in 1915, owing to the fact that no very large number lived through the season and could therefore be expected to appear as beetles in the spring of 1914.

Observations of 1913. A sample digging in a slight hollow on the farm of Mr W. S. Miller, East Greenbush, included approximately one and one-half square feet and uncovered nine nearly full-grown white grubs, four adults of *Lachnosterna fusca* Froh. and the cocoon of a parasite, probably that of *Tiphia inornata* Say. Most of the insects were found at a depth of approximately 15 inches. A second sample digging near the first

resulted in securing five full-grown grubs and two *Tiphia* cocoons. A third digging comprising about 1 square foot produced only three grubs. The occurrence of a few beetles in these and other diggings suggests the possibility that a few individuals of *L. fusca* may complete the life cycle in two years, as Davis has found to be the case with *L. tristis* Fabr.

The most interesting development of the season was on the farm of Mr Jesse Weaver in East Schodack. Here were found, April 24th, large numbers of a stout, white maggot, the larvae of a bee fly or a robber fly. The abundance of this enemy is evidenced by the following data. The turning of four furrows each a few feet long and in a field badly infested with white grubs the preceding season, resulted in finding one adult, *Lachnosterna fusca*, nine white grubs, four *Tiphia* cocoons and twenty-six of the Dipterous maggots. The white grubs and the maggots occurred at an approximate depth of 4 to 6 or 7 inches. The above numbers are fairly indicative of the relative abundance of the grubs and maggots. The latter were mostly moderately large and stout, though a few were about half the size of the larger ones. Practically all were in a vigorous condition and were most abundant in portions of the field which had been very badly infested by white grubs the preceding season. They were presumably important factors in destroying these grass pests.

Similar conditions obtained June 18th in an adjoining field belonging to Mrs Kane. There was, as in the other case, a marked restriction of the maggots to grass areas which had been seriously affected by white grubs the preceding season and, as a rule, where maggots were numerous few white grubs were to be found, while the latter were relatively more numerous where there were no maggots. The most obvious explanation of this condition is that the parent flies oviposited freely in the badly infested areas, and as a result most of the white grubs were destroyed, while the sparsely infested parts of the field were largely overlooked by the flies, and as a consequence the grubs were relatively more abundant last spring. The probability of these maggots preying upon white grubs was well shown by the fact that in one box a maggot was observed actually attached to a white grub, while in other instances there was a marked mortality among white grubs confined in breeding jars in which there were a number of these Dipterous larvae. The proportion of the two forms is shown by a collection of seventy-nine maggots and fifty-five white grubs as a result of following the plow for less than two hours. There appeared to be

no difference between these maggots and the ones collected in April, and an examination of a breeding jar July 21st showed a continuation of the larval existence. September 13th maggots were again found on the farm of Mr Weaver and adults of *Pro-machus fitchii* O. S. were reared in April 1914, indicating a three year life cycle.

Larva. Length 2.5 cm, diameter 5 to 6 mm, whitish or pale yellowish white, slightly thickened near the middle and tapering somewhat toward both extremities, especially posteriorly, the segmentation distinct. Head small, partly retracted, brown to dark brown, approximately conical, the prominent mouth parts forming the anterior half; mandibles stout, slightly decurved, tapering to an obtuse extremity and practically inclosing the slender, minutely and retrosely barbed, lancetlike maxillae; antennae inserted at the base of the mandibles, short, stout, biarticulate, the basal segment disk-shaped, the apical one narrowly oval; a slender seta above and near the base of the antennae; clypeus V-shaped; the epicranium with an irregular series of stout, proclinate setae. Body walls firm, slightly wrinkled, shining. A well-developed circular spiracle with two slitlike orifices occurs near the posterior fourth on the first body segment, and larger spiracles near the middle and subdorsally on the penultimate segment, the latter circular and with but one orifice; terminal segment tapering, broadly rounded, with two pairs of sublateral slender setae near the anterior third and two pairs of submedian setae at the posterior extremity, one pair being just above the lateral line, the other just below; ventral surface of the last two segments excavated to form a median elongate rounded depression, margined laterally and posteriorly by broadly rounded ridges.

SPOTTED HEMLOCK BORER

Melanophila fulvoguttata Harr.

Early last spring our attention was called to dying hemlocks in the New York Botanical Garden, and an investigation showed a serious infestation by the spotted hemlock borer. Dr W. A. Merrill, acting director, stated that five hundred dead trees had been cut out during the past two years, most of them probably having been killed by this insect. Dying hemlocks were also noted in adjacent territory and at Tarrytown, the trouble in some instances, at least, being due to the operations of this insect. The severity of the attack was such that one hundred and twenty-seven beetles and seventy-two parasites were reared from a section of a log about 2½ feet long and 12 inches in diameter. The tree from which this was cut was infested from the very base of the trunk nearly to the top, the inner bark of the lower portion being badly riddled by the galleries.

This insect is credited by Burke with having caused the death of a large amount of hemlock timber throughout the Appalachian and Northeastern States. About 1900 we received reports of dying hemlocks from near Syracuse. An investigation of burned areas in the Adirondacks during early July 1903 showed that beetles were then ovipositing in dying and dead trees on tracts near Big Moose which had been swept by fire April 30th. An examination on August 10th resulted in finding some trees, untouched in July, infested by the borers. This species has also been recorded from spruce, though no records of serious injury by it to this tree have come to our notice.

Description. The beetle is about three-eighths of an inch long and has a dark metallic color with grayish reflections above the mouth. The head, thorax and wing covers are marked with somewhat coarse, irregular, transverse punctures slightly resembling the graining of morocco leather. Each wing cover bears three more or less distinct, nearly circular or lenticular-shaped, yellowish or white spots.

Pupa. Length, three-eighths of an inch, moderately stout, flattened, and of the ordinary Buprestid shape. The older pupa shows a distinct infuscation of the eyes, labium, mandibles and the basal portion of the anterior and mid tibiae. The nearly mature pupa shows most of the color of the beetle, the wing covers apparently darkening last.

Larva. Length five-eighths of an inch, white, moderately slender, the second thoracic segment distinctly enlarged and with yellowish brown thickenings dorsally and ventrally. The mouth parts of the head are more or less fuscous.

Life history. The beetle is mostly a midsummer species occurring in New York State the latter part of June and during July, though Dr A. D. Hopkins records taking the adults in West Virginia late in March and during May, June and July. Specimens reared under insectary conditions began issuing April 4th, appeared in numbers April 17th to 28th and continued to emerge until May 14th—a total of nearly seven weeks. Beetles in the State collection and taken in the open bear dates from the last of June to the latter part of July.

The eggs are evidently laid in crevices of the bark, sometimes in pairs, since the young larvae make slender, sinuous galleries diverging from one point in the inner bark, the presumably common entrance of the two. The older larvae excavate broader and

more irregular, partly frass-filled burrows which frequently run into each other and most effectively girdle badly infested trunks. Our observations indicate a preference on the part of the insect for the thicker bark of the lower portion of the tree, since the borers in this latter situation were nearly twice the size of those found under the thinner bark of upper part of the trunk. It is

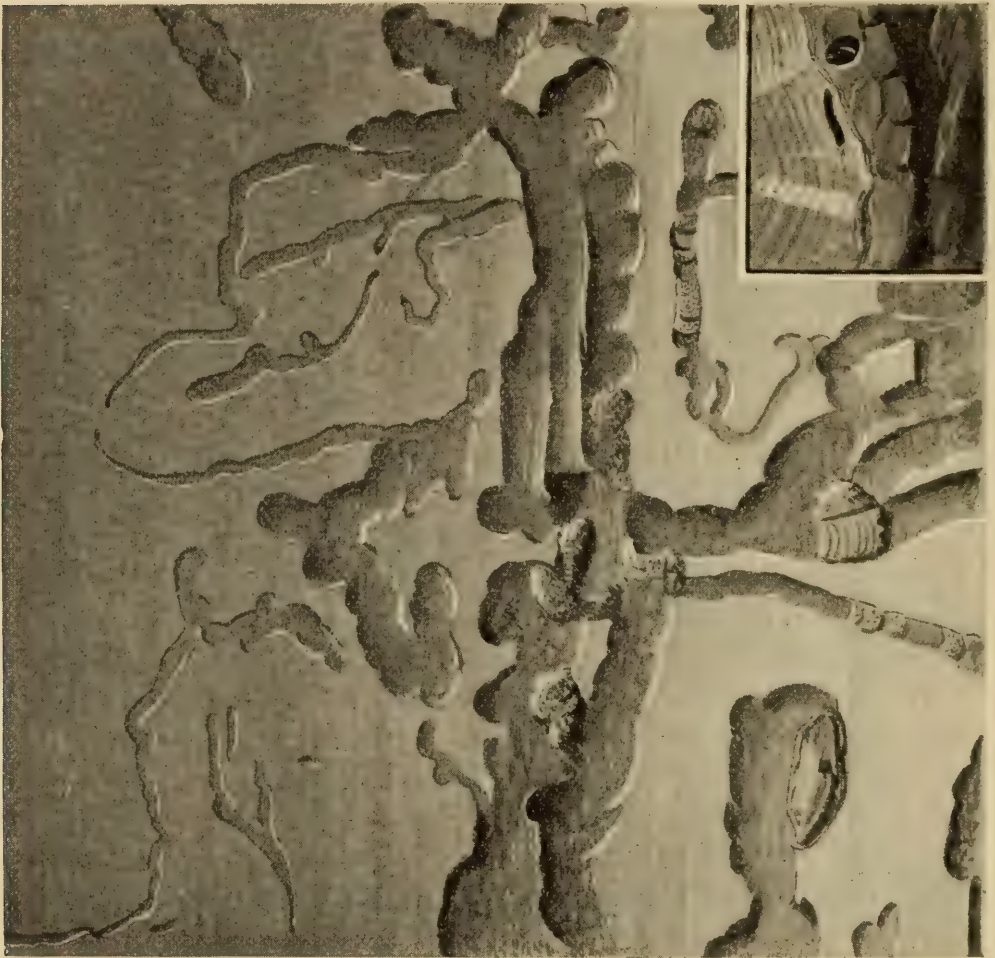


Fig. 6 Work of spotted hemlock borer; note two galleries originating from near a common point; galleries of adult and larva in section shown in upper corner (natural size, original)

possible that the latter come from later deposited eggs. The full-grown larvae winter in the galleries and in the spring pupate in shallow cells excavated in the outer bark. The beetles emerge through obliquely oval holes with a major diameter of about one-eighth of an inch.

Distribution. This species occurs throughout the middle and northern part of the United States, being very abundant about Lake Superior, according to Le Conte. It has been taken by Mrs Slosson on Mount Washington and appears to be prevalent in the Appalachian region.

Parasites. The material obtained from New York, as noted above, produced a considerable number of parasites, by far the most abundant being *Odontaulacus bilobatus* Prov., the exposed pupae of which may be found in small cells within the bark. The light brown, narrowly oval, papery cocoons about one-half an inch long, of *Bracon pectorator* Say, were found singly or in clusters in the galleries of this insect and the adult reared. A third parasite, *Spathius trifasciatus* Riley, was also obtained. The borings of this beetle were inhabited by the pinkish larvae of a gall midge, *Camptomyia tsugae* Felt. This latter species occurred in some numbers and probably subsists upon the dead or decaying woody tissues. *Aulacus abdominalis* Cress., *Bracon pectorator* Say and *Eupelmus cleri* Ashm. have been reared by Doctor Hopkins from wood infested by this borer. He also took upon the infested bark, specimens of *Xylonomus insularis* Cress.

Control measures. The most effective method of checking this borer under ordinary conditions is to cut out all dead or sickly trees and burn the thicker bark, at least, during winter or early spring. Hemlocks injured by fire or wind storms, after April 1st, may well be left as trap trees and removed the following winter.

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WHITE PINE WEEVIL

Pissodes strobi Peck

The extensive planting of white pines in the reforestation work of recent years has produced conditions very favorable for this weevil, since the pest breeds by preference in vigorous shoots of trees 2 to 10 or 15 feet high. The species is widely distributed and quickly establishes itself throughout even large plantings. There appears to be no practical way of preventing this invasion of reforested areas. The beetles feed upon the vigorous shoots of the previous year's growth, placing their eggs in shallow pits just under the bark. The white, brown-headed grubs hatching therefrom soon destroy most of the vital tissues, killing many leaders and practically ruining the young trees.

Signs of injury. A serious infestation is liable to result in many leaders turning brown and dying in early July. Affected shoots have the inner bark and more or less of the sapwood riddled by irregular galleries partly filled with borings. The first evidences of attack in the spring are drops of resin or pitch exuding from small punctures made by the beetles, the severity of the damage depending upon the extent of feeding and the number of eggs deposited. An examination of a recent planting at Cooperstown, N. Y., July 8, 1913 showed all gradations of injury from wilting leaders to those which had been entirely destroyed. Occasionally a young tree bore pitch masses an inch or two below the uppermost ring of branches, and in such cases the leaders were usually infested. In cases where the injury extended for perhaps 3 or 4 inches along the stem there was a distinct shortening of the new growth with a corresponding massing of the needles. This looked a little as though there might have been a fungous infection, though an examination showed that the trouble was with little question due to the work of the weevil. Unless the grubs are numerous enough to girdle the leaders partly, there seems to be a fair chance of the shoot recovering from the attack and developing satisfactorily the following year.

Description. The parent insect is a snout beetle about one-fourth of an inch long, reddish brown to dark brown, with a peculiar whitish spot near the posterior third of each wing cover and white mottlings upon the sides and the legs.

The globular eggs are whitish transparent, about one-sixteenth of an inch in diameter, and are placed just under the bark.

The grubs are moderately stout, white, footless borers, with a brownish head, and when full grown are about three-eighths of an inch long.

The creamy white pupa is about one-quarter of a inch long, white, except for the dark brown eyes and the brownish tips of the jaws. It may be easily recognized by the stout beak lying against the breast. The tip of the last abdominal segment bears a pair of slender, curved spines. As the pupa attains maturity the color of the beetle begins to appear.

Life history. The weevils commonly winter in any available shelter and, according to observations upon allied forms abroad and in this country, it is probable that the beetles live two or three years, depositing eggs

each season. The latter are usually placed in the leading shoots during May and June. An examination at Cooperstown May 21, 1913 showed that many of the leading shoots bore feeding punctures and a number of eggs were found, although the season was cold and backward. The eggs are said to hatch in from six to ten days, and the small, white grubs at first feed



Fig. 7 Pupal cells of white pine weevil (natural size, original)

upon the inner bark and sometimes extend their operations down to portions of the stem two years old. At Cooperstown July 8th there were numerous full-grown grubs in the cells and about 10 per cent of the shoots in the planting had been killed. The grubs are sometimes so numerous in a stem as fairly to riddle the inner bark and, in some instances, there is hardly room enough for the oval pupal cells, each about one-quarter of an inch long. The beetles escape from the shoots the latter part of July through to early September. It is well known that the weevils persist throughout the season, they being more abundant, according to our collections, from the

middle to the latter part of June and from the 9th to the latter part of August. This pest displays a marked preference for the more vigorous leaders of white pine, though it also attacks pitch pine and spruce.

Natural enemies. This borer is preyed upon by woodpeckers and a number of parasitic insects. The latter should be protected and allowed to escape wherever practical.

Preventives and remedies. Cutting out and burning the infested leaders in midsummer, if systematically followed, will result in material benefit. It is well to delay this operation until pupae have begun to develop, since it will then be easier to recognize the infested leaders and there will be little or no danger of weevils escaping. Generally speaking, from the middle to the latter part of July will be the best time for this work. The infested shoots should be placed in a barrel laid upon its side, or other receptacle, and the open end covered with ordinary wire screen (one-tenth inch) fine enough to prevent the escape of the weevils and yet allow the issuance of parasites. It is desirable to leave these infested tips among the trees so that the parasites will have less difficulty in finding their natural prey.

The difficulty with the procedure described above is that one generation at least is allowed to injure the trees before much is accomplished. Earlier collecting in the field showed a surprising scarcity of weevils on trees which had been systematically gone over. The fact that adults may live two or even three years and deposit eggs each season, makes it even more desirable that they should be destroyed early. It is comparatively easy to beat the weevils from small trees into a moderate to fair sized insect net. In cooperation with Mr Waldo C. Johnston of Cooperstown this method was tried on an area of fifty acres set with about 60,000 pines. The work was started a little late, namely about May 21st, and the trees carefully collected over four times at intervals of approximately four or five days, each. At the outset two to four weevils were caught on each tree, and toward the last only one or two insects for each row of probably 400 trees would be obtained. The cost of these four collections amounted to \$64 or only \$1.28 an acre. An examination July 8th resulted in our not being able to find any weevils on the pines. It is very probable that three collectings, particularly if the first was a little earlier, namely the first or second week in May and the other two at about ten day intervals, would have resulted in capturing most of the weevils at

a comparatively slight expense. The probabilities are that relatively few insects will occur upon the trees another season and only one or two collections may be necessary to secure practical immunity for the planting until the trees attain a size which will make them immune from serious injury. There is no reason why, with improved devices, the cost of this operation could not be materially lowered.

HICKORY BARK BORER

Eccoptogaster quadrispinosa Say

The operations of the destructive hickory bark borer have been followed another season in the vicinity of New York City, and it is gratifying to state that in a general way the injury has not been so severe as in 1912. This is probably due in part to natural causes, since several localities were found the preceding season where the young grubs had evidently been destroyed by natural agents. In some instances this beneficial result was undoubtedly due to the activities of a small parasite and in other cases only Dipterous maggots, possibly a species of *Medeterus*, were found in the otherwise empty galleries.

Last season some adults were observed near New York entering the trees and laying eggs about July 10th, and an examination July 16th, of two hickories with trunk diameters of approximately 7 or 8 inches showed that practically all the leaves of one tree had wilted and those of the upper portion of the other. This injury was so general that it could not be attributed to petiole infestation. An examination the next day on Long Island showed other trees in a similar condition. In this latter case the galleries of the larvae extended from one-half to one and one-fourth inches from the parental burrow. In both cases the trees had been attacked by so many insects that they were speedily girdled, and an examination of the Bronxville trees September 24th showed that both were dead, although they were in excellent condition the preceding summer. There was no evidence of any material injury to these trees prior to 1913.

Continued work with remedial applications has shown little or no material injury from the use of a 10 per cent Barcurol solution upon the trunk, and decided benefit so far as destroying beetles, eggs or young grubs are concerned. This treatment, in order to be most effective, should be made as soon as possible after the beetles have entered the tree, otherwise there is danger of the grubs working so far into the tissues as to be unaffected by the insecticide.

Inasmuch as the beetles may attack trees in force during a period of several weeks, it is obviously desirable to watch closely for the appearance of the pest.

Through the courtesy of Mr Herman W. Merkel, forester of the New York Zoological Park, we were allowed to examine some small hickories treated with 25 and 50 per cent solutions of Barcurol, and also one painted with the undiluted material. It was found that the 25 per cent solution caused little injury to the tissues beyond the area traversed by the borers, and that a considerable proportion of the grubs was destroyed. The 50 per cent solution and the undiluted material, however, penetrated the galleries readily and then soaked to a depth of half an inch or so into the inner bark and sapwood and laterally to a distance of one and one-half inches from the gallery. It is therefore obvious that the stronger preparations can hardly be advised for this purpose.

Drought and borer injury. Serious injury by the hickory bark borer began to develop at Geneseo in 1898, and by 1900 many trees, located for the most part on moderately low, naturally moist soil, had died. Unfortunately, weather records for that locality are not complete. It is worthy of note that at nearby Avon from April to June 1896 there was a deficiency of over 1 inch for each of these months, the record being as follows: April, 1.05; May, 1.98; June, 1.97 inches. Approximately the same conditions obtained in 1897, the precipitation being, April, 1.21; May, 1.75 and June, 1.96 inches. These figures should be compared with the normal precipitation for these months, which is: April, 2.09; May, 2.64 and June, 3.22 inches. The total precipitation for this year was only 20.36 inches, while that for 1899 was but 19.35, the normal being 29.46. The data are not so extended as could be desired, but are nevertheless somewhat suggestive.

The outbreak by the hickory bark beetle in New York and vicinity began about 1908 and had greatly extended its area and become rather general by 1912. An examination of the weather bureau records in New York City shows an interesting condition. From 1906 to 1912 inclusive there has been a deficient rainfall except for the year 1907 alone, at which time there was an excess of only half an inch. The total deficiency during this period amounted to 28.56 inches. The most marked deficiency for any year was in 1910, with a precipitation 8.75 inches below the normal, a reduction of approximately one-fifth. A scrutiny of the monthly precipitation shows that in 1906 the scarcity of rainfall occurred mostly from

June to September, there being during these months from an inch to nearly an inch and a half less than the normal precipitation. The next year, 1907, although there was a slight increase in the annual precipitation, there was a considerable shortage for the months of July and August, this amounting respectively to 3.36 and 2.05 inches. In 1908 there was a shortage of 1.56, 1.99 and 1.79 inches for the months of June, September and October respectively. The following year, 1909, there was a scarcity of rain during May, June and July, amounting respectively to 1.46, .09 and 2.56 inches, there being an excess of 3.41 in August, and a shortage in September of 0.93. In 1910 there was a shortage in May of 1.52 inches, an excess in June of 1.84 and a shortage in July, August and September amounting respectively to 4.31, 2.40 and 2.16 inches. The slight excess in June could hardly offset the large deficit of July and the continued scarcity in August and September. Again, in 1911 there was a deficient precipitation in May, July and September, amounting respectively to 2.27, 2.99 and 2.08 inches, while in 1912 there was a deficiency from June to September, amounting to 2.09, 1.28, 1.76 and 0.21 inches, for the four months in the order named.

It will be noted from the above facts, although the deficiency during this period was not as a whole very excessive, it was progressive and the shrinkage in rainfall almost invariably came during the growing months and at times most likely to affect vegetation adversely. The general result in this region was abundantly evidenced by the unfavorable condition of the trees throughout the section, it being particularly marked in 1910 and 1911 and was accompanied by an abnormal scarcity of water. Many cities and villages in this general region suffered about this time from a severe shortage of water. A number of trees, particularly soft maples and others standing in naturally moderately moist, low localities, died, the major cause probably being scarcity of moisture.

With the above facts in mind, it seems very reasonable to believe that these unfavorable climatic conditions may have reacted upon our hickories, reducing their normal resistance considerably and resulting in conditions which were extremely favorable to the multiplication of bark borers and the subsequent destruction of many trees which would otherwise have survived.

There are doubtless other factors which may be primary in bark borer attacks, especially in extended forest areas. Fires, wind storms and injudicious cutting may precipitate an outbreak by producing conditions favorable for the development of hosts of these in-

sects. Such is very likely to be followed by attacks upon trees which, under normal conditions, would escape unharmed. Causes such as those just mentioned are rare in the less thickly wooded and more settled sections where extended, close stands of timber and extensive logging operations are almost unknown. It is in just such regions as these that severe droughts are most prevalent and injurious, and in such localities it seems very probable that a great scarcity of moisture for an extended period may be an important primary cause in inducing serious injury by bark borers.

PITTED AMBROSIA BEETLE

Corthylus punctatissimus Zimm.

The work of the pitted ambrosia beetle is indicated by wilting or dead shoots easily broken off near the surface of the ground and revealing a series of blackened, closely set, nearly horizontal galleries some one-sixteenth of an inch in diameter and frequently containing, especially in the vertical brood chambers, stout, cylindric, black beetles about one-eighth of an inch long. This borer, working, as it does, at the base of the shoots, weakens the entire stem, while the rhododendron clear-wing, noticed elsewhere in this report, may limit its injuries to portions of a shoot and its galleries are rarely within a foot of the ground. The hybrid rhododendrons appear to be exempt from attack.

Injuries. An examination September 24th of conditions on the estate of Mr C. H. Matthiessen, Irvington, N. Y., showed that portions of rhododendron beds 50 to 150 feet in length which, it was stated, had earlier been in a thriving condition, and standing from 3 to 5 feet high were then in a very unsatisfactory condition. Few of the shoots were over 2 feet in height, there were open places here and there and sickly or wilting shoots were plainly in evidence. Mr Matthiessen stated that this trouble has been apparent upon his place for several years and that, in his opinion, much of the injury due to this beetle had been blamed by growers, upon drought and other untoward conditions. The stems attacked varied in diameter from approximately half an inch to an inch or an inch and one-fourth. Specimens received from Mr Charles Goodyear, Rockwood, Tarrytown, showed that this borer is also at work there, though examinations of rhododendrons in the New York Zoological Garden and in Prospect Park, Brooklyn, have failed to reveal the presence of this beetle.

There is an extremely interesting record of injury by this species

in 1882. Dr C. Hart Merriam states that about the first of August he observed that a large percentage of the sugar maple under growth in Lewis county appeared to be dying, the leaves drooped, withered, finally shriveled and died. Most of the seedlings attacked were about a half an inch in diameter. He estimated that hundreds of thousands of young sugar maples were killed in that locality. This outbreak was evidently sporadic in nature, since there have been no records of serious injury subsequently.

Description. The original description of this borer is as follows:

Long. $1\frac{1}{4}$ lin. Short, thick, compressed, shining black, antennae and feet ferruginous; front glabrous; prothorax roughly tuberculate in front, shining behind, with fine sparse punctures; elytra punctured strongly, but not in rows, behind rounded, without furrows or teeth.

Dr A. D. Hopkins, in describing the allied *C. columbianus* Hopk. states that in *C. punctatissimus* the head of the female is deeply and coarsely punctured in front, the declivity of the elytra plain, and that the middle and hind tibiae have only three teeth near the tip.

Galleries. The beetles enter the side of the stem at or below the surface of the thick mulch, through a circular hole about one-sixteenth of an inch in diameter. This may be more or less oblique and opens into a more or less regular series of circular, closely placed, horizontal galleries. These latter may be so numerous as to leave only a very thin shelter of bark with a little of the outer sapwood externally and almost no direct longitudinal wood fibers between the outer and the inner horizontal galleries. From each of these galleries there are a series of vertical brood chambers, each about one-eighth of an inch long, and there is usually one or more vertical or nearly vertical galleries which may lead to a lower or upper series of workings, not infrequently both. These galleries may be easily recognized by reference to the figure, on account of their regular plan and the characteristically blackened walls. The operations of this insect are confined to parts of the plant within 3 inches above the ground, and so far as our observations go, do not penetrate the roots, though the lowest galleries may approach very closely to the crown.

Life history and habits. The life history of this species has not been worked out in detail. Dr C. Hart Merriam first studied the insect in sugar maple and has faithfully described its method of work. It is perhaps significant that his attention was not attracted to the operations of the insect until early in August. Dr E. A.

Schwarz studied the operations of this insect in the common huckleberry and states that it occurs here and there in huckleberry beds and is apparently very local. His explanation for this condition is that the beetles are probably subterranean, appearing only rarely above the ground, apparently being very much at home in the soil. He states that the adults winter either in the larval chambers or special hibernating galleries. He found as many as fifteen larval cells in one stem. Dr A. D. Hopkins records adults and pupae of this species August 19, 1893 in Wisconsin, while our observations the latter part of September 1913 resulted in finding no larvae and only a very few pupae, most of the insects having changed to adults. An examination of one rhododendron stem only half an inch in diameter resulted in finding twenty-four brood chambers opening

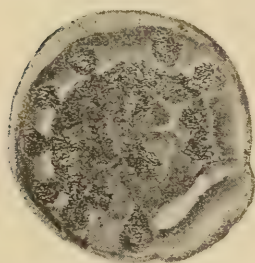


Fig. 8 Transverse sections of rhododendron stem showing work of pitted ambrosia beetle (natural size, original)

from one series of galleries. Two and three series of galleries in stems of this size or larger, should mean fifty to seventy-five beetles, respectively. This gives an idea of the prolificacy of the insect and explains the death of badly affected shoots. A practical point in regard to this insect as a rhododendron enemy is that its operations appear to be confined largely to shaded localities where there is an abundant mulch. Sunny, grassy areas which obviously afford comparatively little shelter are practically free from injury. Doctor Hopkins points out that not all shrubs attacked by this beetle succumb, since he has found galleries of this

species deeply imbedded in growing wood, an indication of infestation years before. This is probably true of only the slighter infestations and does not necessarily apply to rhododendrons.

Food plants. This borer has been found in sugar maple (*Acer saccharum*), sassafras, dogwood (*Cornus*), water-beech (*Carpinus*), ironwood (*Ostrya*), hazel (*Corylus*), huckleberry (*Gaylussacia resinosa*), and Rhododendron.

Distribution. This borer appears to be widely distributed, it having been recorded from points in the eastern, middle, southern and western United States.

Remedies. The most obvious method of control is to cut out the wilting infested stems and burn them. Care should be taken to avoid breaking the shoots at the point of injury and thus allowing a number of the beetles to fall out of the galleries and make their way

to nearby stems. Systematic cutting out of weakened plants is advisable in most cases and, as a rule, no special expense will be necessary to check this pest.

Bibliography. An extended bibliography accompanied by a record of distribution and food plants is given in Museum Bulletin 134, page 91, to which the reader in search of further information is referred.

CACTUS MIDGE

Itonida opuntiae Felt

Species of *Opuntia*, the flat-leaved, oval cacti, not the columnar forms, may be injured by the deep red larvae of the cactus midge and most seriously affected by a bacterial or fungous trouble which gains access to the inner tissues through the injuries. The fungus or bacterium is by far the most destructive and is apparently dependent for favorable media, so far as cacti are concerned, upon the work of the midge larvae.

Signs of injury. Infestation is first indicated by an indistinct swelling, usually at the base of a spine, presenting so few characteristics that the person in charge of the plants and therefore familiar with the work of the insect, could not be certain of the presence of maggots without cutting into the tissues. This swelling gradually becomes somewhat larger and eventually an opening appears. The maggots work themselves out and either crawl down the plant or drop to the ground. The desertion of the cacti is followed by an infection which results later in a copious exudation of a mucilaginous fluid or sap which hangs in irregular masses an inch or so in length (pl. 15, fig. 2). This infection is followed by the slow death of the affected lobe and may eventually result in the destruction of portions of the plant or even entire plants. In some instances the work of the maggots is inhabited by a small Ptinid beetle belonging to the genus *Catorama*.

Early history. This pest was first brought to our notice in 1909 by Mr George V. Nash, head gardener of the New York Botanical Gardens. The species, according to his statements, occurs in *Opuntia banburyana* from Italy and an *Opuntia* from the British West Indies. Not much further was heard of this insect until 1913, at which time it was characterized as a very serious pest in a valued collection of cacti. Earlier it was thought that this midge might be American, since the original distribution of the host plant is limited to America, though subsequent statements would seem to indicate that this insect may possibly be Italian in origin. Mr

Becker, connected with the New York Botanical Garden, states that some recent cuttings received from Italy and kept in a house well separated from previously infested material, was found after a few weeks to be infested by this midge. This is suggestive, though not necessarily conclusive, evidence as to the original home of the insect.

Life history. Conditions in the cactus house indicate that this species may breed almost continuously throughout the winter months, and there would seem to be no reason why this process might not continue during the summer if the plants were not exposed to too low temperatures. The midges may be observed in the greenhouses, flying around the plants and alighting on the pots or the cacti. They do not seem to make their way to the windows and there was no evidence of their being captured in spider webs. A cactus lobe, apparently in a healthy condition, was cut into and the interior found to be fairly honeycombed by the maggots. The larvae, on attaining their development, emerge from the plants and may be found lying on the surface of the soil in the pots or in the coal ashes covering the benches. The transformation to the pupa and emergence of the adults occur in these situations without any difficulty.

An effort was made to ascertain the duration of a life cycle but without much success, since the midges do not appear to thrive under ordinary cage conditions, although a small greenhouse is well adapted to their requirements. Infested cacti were received and placed in a large breeding jar March 10th, adults emerging therefrom as follows: April 15th, 1; 21st, many; 23d, 12; May 9th, 8; 10th, 10; 12th, 5; 16th, 3; 17th, 4; 19th, 12; 21st, 5; 22d, 3; 23d, 24; 27th, 8; 28th, 2; 29th, 4; 31st, 11; June 2d, 4; 4th, 9; 5th, 5; 7th, 4; 9th, 3; 11th, 2; 13th, 7; 25th, 2; 26th, 1; July 11th, 6; 12th, 3; 14th, 4.

A distinct periodicity will be noted in the appearance of the midges, in that they were much more abundant April 21st and 23d, May 19th and 23d. There was apparently no breeding in this jar, aside from the larvae already in the soil and the plants attaining maturity. If this be the case it would appear that under certain conditions a generation may extend over a period of four months, the flies issuing at irregular intervals. This periodicity in the appearance of the midges was also observable in the greenhouse, and in at least one case numerous midges appeared in both at the same date. There may be a period of nearly three weeks between the time the larva leaves the plant and the issuance of the imago, since

on March 14th, one larva and a pupa were placed in a tumbler with a little sand and on the 3d of April a midge issued. It is possible that this period marks the duration of the pupal stage.

Description. The larva is about one-eighth of an inch or 3 mm long, rather stout, deep red and with a well-developed bidentate breastbone.

The midges are delicate, dark reddish brown flies, the male having a length of about 1 mm, the female 2 mm. Technical descriptions of both sexes have been published by the author.

Remedial measures. This pest appears to have been controlled by thorough and repeated fumigation with hydrocyanic acid gas, during a period of about three months, beginning March 1st and continuing until the weather became so warm that the ventilators of the greenhouses were kept open. Dr A. B. Stout has kindly given me the following summary of the treatment: "The greenhouse was closed about 5 o'clock, three stone jars containing 175 cc of 25 per cent sulphuric acid (1 part acid of 1.84 specific gravity to 3 parts water) were placed at equal distances in the greenhouses. In each of these was dropped a paper bag containing 45 grammes of potassium cyanide, 60 per cent strength. These bags were dropped in quickly, the doors securely closed and the fumigation continued until the next morning, and the greenhouse was thoroughly ventilated for a few minutes. The house contained about 1600 cubic feet, hence the treatment was about one-third the strength usually recommended for fumigation." It was stated that not only did the fumigation destroy the midges, but it appeared to have a paralyzing influence upon the larvae lying upon the surface of the soil and they seemed unable to survive the daily treatments. The cacti showed no ill effects and an examination of the plants as they were brought in this fall, indicated entire or nearly entire freedom from this midge.

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BANDED GRAPE BUG

Paracalocoris scrupeus Say

A new pest of the grape appears to be developing in the western part of the State, since the young of this species have been found by Mr L. F. Strickland, damaging fruit of Campbell's Early and Worden grapes in the Niagara district.

Evidences of injury. Irregular blasted clusters (plate 16) and minute, black spots on the affected fruit are the most apparent signs of injury. This damage may be so general as to include entire clusters, portions of clusters or limited to berries here and there on the bunches. The owner estimated that half the crop was lost in one vineyard. The injury is caused by a young, greenish brown and white-marked bug (easily recognized by the white-banded antennae and legs), about one-sixth of an inch long, the adult, appearing later, being one-fourth of an inch long, brownish gray in color and somewhat resembling the very common tarnished plant bug. The two insects are related and appear to have somewhat similar habits.

Early history and depredations. Very little is known concerning this insect. It was described in 1831 by Thomas Say, with no more precise indication of its habitat than "United States." It has been taken by Mr E. P. Van Duzee during June and July about Buffalo. The late Dr J. B. Smith records it from Staten Island and several New Jersey localities.

The following observations by Mr Strickland give an idea of its potentialities. In one instance he noticed a good thrifty vine with fifty-two clusters formed, all of which had been destroyed by the bug. The tabulation given below shows in more detail, conditions which may obtain in fields infested by this pest.

Injury by banded grape bug

NUMBER OF BUNCHES COUNTED	NUMBER OF GRAPES DESTROYED	NUMBER OF GRAPES MATURING
I.....	13	44
I.....	36	39
I.....	40	38
I.....	36	41
I.....	24	91
I.....	51	90
I.....	54	14
2.....	All	None
I.....	46	94

The above data, omitting the two bunches which were entirely destroyed, shows that nearly 40 per cent of the fruit on the clusters counted had been ruined. Mr Strickland believes this bug to be causing serious damage to Campell's Early grapes throughout the region. The work of this species was observed in the vineyards of Messrs S. C. Treichler, Sanborn and F. L. Young, Lockport, the insect having apparently become established in the latter vineyard.

Niagara grapes, even when growing among Campbell's Early, appear almost exempt from the trouble.

Life history and habits. The young bugs or nymphs cause most of the injury in early June, blasting blossoms and the young fruit by sucking the sap. They attain maturity early in July and the winter is presumably passed in the egg stage as in the case of the allied tarnished plant bug. It is possible that this insect can maintain itself in vineyards where no other food plant is present. It has been recorded from both sumac and the bladder nut, *Staphylea*.

Description. The adult, kindly determined by Mr E. P. Van Duzee, has been characterized briefly above and the original description is reproduced herewith.

Body black. Head with a dull yellowish line and superior orbits, variegated at the mouth and beneath. Antennae, first joint more than half the length of the second, and rather robust, hairy; second joint a little thicker at tip. Thorax yellowish, anterior margin, two dots, and a slight dot near the posterior angles black; scutellum yellowish, dusky on the middle of the base and on the basal angles. Hemelytra immaculate. Feet with minute, pale points.

Length to tip of hemelytra nearly one-fourth of an inch.

This species is said by Van Duzee to be very variable. He states that the most abundant form in the vicinity of Buffalo is the pale or ochreous variety generally taken on *Staphylea*. There is another variety, possibly a distinct species, which has the pronotum black with the narrow edge and three longitudinal vittae ochreous.

A detailed characterization of the nymph is given below.

Nymph. Length 4 mm, width 1.75 mm. Antennae about as long as the body, the basal segment rich brown and thickly set with short, stout setae, the second segment more than twice the length of the first, the distal two-thirds dark brown and thickly setose, the basal portion white, the third segment about half the second, the basal portion white, the distal dark red, sparsely setose, the fourth segment one-third longer than the third, brownish yellow, each segment more slender than the preceding. Face short, roundly triangular, the base of the rostrum sparsely setose; occiput a variable yellowish green with indistinct brownish markings anteriorly; eyes reddish brown. Mesonotum mostly yellowish green, the anterior and posterior lateral margins a variable fuscous. Wing pads greenish basally, reddish brown apically and extending to the third abdominal segment. Abdomen dorsally with the basal segment greenish, the succeeding segments to the sixth greenish and variably mottled sublaterally with dark reddish brown, the distal segments dorsally dark reddish brown, except for an indistinct oval median area apically, which is mostly green; the entire dorsum of the body

rather thickly set with short fuscous setae. Legs; femora mostly dark reddish brown, variably mottled with whitish; dorsally and basally greenish, the posterior with an indistinct irregular, greenish band near the middle dorsally; tibiae, the basal fourth similar to femora, the second and distal fourth white, the third fourth dark reddish brown; tarsi, the first segment and basal half of second white, the distal half of the second and claws dark brown; venter a nearly uniform pale green, except for a variable striping or marking laterally, that of the thorax rather narrow and dense, while on the abdomen it is broader and diffuse; terminal segment yellowish orange with dark reddish brown markings laterally.

Remedial measures. The most promising method of controlling this insect in vineyards where its abundance justifies such measures, is spraying with black leaf 40, using 1 quart to 200 gallons of water to which is added soap for the purpose of promoting distribution and adhesiveness. The spraying should be early in June, possibly earlier in order to destroy the young nymphs before they have an opportunity of causing much damage. Particular pains should be taken to cover the vines thoroughly with the spray, especially the lower inner portions which are most likely to shelter the insects.

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THE USE OF MISCIBLE OILS ON TREES

There have been during the last three years some exceptionally unfortunate developments following the application of miscible oils to trees, especially sugar maples. Some have questioned the possibility of oil being the principal cause of the trouble, and since the matter is of considerable importance and may involve the life of highly valued shade trees, observations of earlier years have been continued and are given in some detail below. The data, in our estimation, abundantly justify a refusal to recommend these materials as applications to dormant sugar maples and warrant the employment of cautions couched in no uncertain terms concerning their employment in a similar way for other trees. It is axiomatic that the remedy should not be worse than the disease.

LARGER SUGAR MAPLES AND MISCIBLE OILS

The behavior of the sugar maple commonly found on roadsides, after applications of certain oily compounds, is so characteristic that there should be little difficulty in recognizing the cause of the trouble. A sugar maple at Port Chester, N. Y., having a trunk diameter of about 8 inches was examined July 16, 1913. Nearly all the lower limbs were dead and a few brown leaves were hanging here and there. This tree, we were informed, was sprayed the last of the preceding November or early the following month, with one of the commercial miscible oils diluted at the rate of 1 to 15. It was the intent of the operator to spray the entire tree thoroughly, but in practice there is little question but that more of the insecticide was thrown on the lower portions of the tree — the parts dead at the time we saw the tree — than higher up. Observation showed at once that it was in a vigorous condition last year, and an examination of the foliage, limbs and trunk failed to disclose any adequate cause for the trouble, such as insect enemies or fungous diseases. The hanging leaves showed that the foliage started on the dead limbs and if subsequent developments had been closely followed, there are good reasons for believing that the leaves became unhealthy, thin, pale, then brown spots appeared and there was serious drying, which was followed by the assumption of a rather dark brown color and usually by the dropping of many of the leaves. This showed first on the seriously injured parts, that is places to which considerable oil was applied and where the bark was thin enough so as not greatly to hinder penetration to the

underlying living and necessary vital tissues. This latter was indicated first by brown spots in the inner bark, these discolored parts becoming deeper, extending in area and eventually including all the inner bark and most of the outer active layers of wood. There was then a gradual progressive dying from the points where the tissues had been killed. This latter means the death of limbs and branches above the injury and may involve considerable below, unless the tree possesses sufficient vitality or so little oil has been applied that the maple is able to prevent further invasion of its living tissues. The more vigorous vital portions below may produce suckers, though in some instances even these may succumb later. The injury does not necessarily involve all the lower branches; it may be limited to a few on all sides of the tree or to several on one side, the determining factor, in our estimation, being the amount of oil applied locally. There may be a late dying of individual branches and there are good reasons for believing that not all the injury may become apparent at the end of the first or even the second season following the application.

Other changes may occur in conjunction with the death of the limbs. The bark on the trunk, especially if this be smooth and comparatively thin, may be so seriously affected that large areas die. July 16th, the bark on the trunk of one tree and at the base of the affected branches was badly cracked, these cracks being 12 to 15 inches long. September 24th there was a white fungus showing at the base of the lower limbs and also on the trunk to a distance of about 4 feet from the ground. An examination at this later date showed that considerable areas of the bark on the trunk were dead and loose, though the cracking was in an incipient stage. Some of the bark on the base of the larger affected limbs was loose and nearly ready to drop. The trunk of the tree at this time had been entered by a number of Ambrosia beetles, the insects unconsciously giving testimony to the dying or dead condition of the underlying tissues.

SIGNS OF OIL INJURY

Severe injury following application of oil preparations appears earlier in the season than that due to drought and, as pointed out above, is frequently limited to the lower branches, a condition almost never seen in the case of trees suffering from fungous affection, insect attack, drought or other adverse conditions. The injury may be comparatively slight and followed by enlarged lenticels, the discoloration, death and cracking of the outer layers of the bark

and, in some instances, accompanied the first season by abnormally large, dark green leaves. The point of injury is definitely indicated by the abundance of sap in the lower parts of the affected tree, the death of the middle portion and a gradual drying out of the terminal parts above the injury. The dead leaves usually have a darker brown color than those on the limbs suffering from drought, sun scald or similar affections. An examination of the inner bark of affected limbs shows a well-marked, girdled or dead area from which point there may be progressive dying in both directions, much depending upon the severity of the injury.

Young fruit trees may have the bark badly blistered in late spring and early summer, the underlying tissues being soft and evidently unhealthy. The death of affected trees or parts of the same may occur the following spring, drag through the summer or be deferred for a year or more. Only recently our attention was called to some trees in an unsatisfactory condition, the owner blaming this upon the painting of the trunks with petroleum some ten years earlier. In the case of very severe injury even the buds may fail to develop the spring following the treatment, or the vital processes may be arrested by the time the leaves are one-fourth grown.

NOTES FOR THE YEAR

Two rare scale insects were found the past season. The first was the inconspicuous *Aspidiotus osborni* New. & Ckll. on white oak at Scarborough. It has not been previously recorded from the State. The second was *Pulvinaria acericola* Walsh on flowering Cornell, *Cornus florida*, at Tarrytown. Both species were relatively abundant on their respective food plants, though apparently causing no material injury. Another scale insect worthy of mention is the *Pseudococcus ledi* Ckll., which was found abundant upon *Ledum* by Prof. C. H. Peck at West Sand Lake, N. Y.



Fig. 9 Regal rose gall (natural size, original)

The peculiar regal rose gall, *Rhodites gracilis* Ashm., was received September 13th from Mrs E. P. Gardner, Canandaigua, who found it in numbers on *Rosa blanda*. This is not only a new species for the State, but appears to be the first precise locality and food plant record for the species.¹ Another interesting though extralimital insect gall, that of *Dryocosmus favius*

Beutm., has been identified in the collection. It was found by Mr W. H. Leivelsperger at Fleetwood, Pa., August 26, 1908.

The balsam plant louse, *Mindarus abietinus* Koch., has been unusually abundant and injurious in a number of Adirondack localities. The spruce gall aphid, *Chermes abietis* Linn., is very prevalent and frequently seriously deforms infested trees. A related gall insect, *Chermes floccus* Patch, was received August 23d from Mr John Nill of Star Lake and also from St Huberts, the galls being numerous in both places. This latter is another new record for the State.

¹ 1907 Amer. Mus. Nat. Hist. Bul. 27:645-46.

The spruce bud moth, *Tortrix fumiferana* Clem., was very abundant in the Adirondack region and the tips of many trees were browned as a consequence. The moths were flying in numbers at Westport early in August. Though this insect has been extremely numerous at times, we have yet to see evidences of serious injury as a result of its work. This species was reported as extremely abundant in several Maine localities by correspondents of the office.

Gnophomyia tristissima O. S. was reared June 8, 1912 from larvae found at Albany under decaying willow bark. In the State collection there are specimens taken at Albany September 11, 1902, at Poughkeepsie June 8, 1902 and one captured by Mr C. P. Alexander at Johnstown August 31, 1907.

The striking *Psilocephala melampodia* Loew was reared May 1, 1911 from a white larva about 1 inch long and tapering at both extremities, found under badly decayed pine bark at Albany.

FRUIT TREE PESTS

Apple tent caterpillar (*Malacosoma americana* Fabr.). The extended depredations of this common insect have been more disastrous than in 1912. Wild cherry trees in the Hudson valley, Mohawk valley, portions of the Adirondacks and in other sections of the State were often defoliated, while all too frequently many of the trees in apple orchards were stripped of their leaves. The latter was so general in some sections as to result in the loss of practically the entire apple crop. Furthermore, these trees are in no condition to produce fruit another year, although a fairly good second crop of leaves was developed. It is perhaps unnecessary to state that damage of this character was confined to unsprayed trees. The probability of severe injury was announced last winter, and it would have been comparatively easy to have checked the pest early by timely spraying with a poison. The characteristic brownish egg belts of this pest are about half an inch long and wherever they are moderately abundant on the smaller twigs, a recurrence of the outbreak may be expected.

This insect is rather easily controlled in several ways. It is not difficult to detect and remove the egg belts in winter, especially on small to moderate sized trees. The nests of the young caterpillars are fairly conspicuous before any material damage is done, and they can be quickly removed with a stiff, conical brush attached to a long pole, a procedure far preferable to the more popular burning

of the nests. The latter permits many of the caterpillars to escape and at the same time is likely to result in injury to the limb. Better than either of the preceding is early and preferably systematic spraying with a poison such as arsenate of lead, using a standard preparation at the rate of 2 to 3 pounds to 50 gallons of water. In the case of badly infested trees it may be advisable to make this application just after the leaves appear, though as a rule the one thorough spraying recommended for the codling moth and given just after the blossoms drop, is ample to prevent injury by this tent caterpillar as well as to take care of the apple worm. The cutting out of wild cherry trees along roadsides and fences is an important preventive measure, because such trees and bushes are a favorite breeding place for the pest.

Plum curculio (*Conotrachelus nenuphar* Hbst.). An interesting modification of habit was caused by a late frost last spring, killing the plums locally at Nassau. As a result, the curculios attacked and severely injured a large setting of young fruit on an adjacent crab apple tree, though comparatively few of the grubs developed successfully. This tree, in earlier seasons when plums were available, was practically free from curculio injury.

Pear thrips (*Euthrips pyri* Daniel). This new pest, noticed in detail in the preceding report,¹ was abundant in the vicinity of Hudson and was controlled for the most part by thorough and timely applications of a tobacco extract. In some orchards there was an unusually large drop of young pears, presumably caused in part at least by the injuries inflicted by this small insect when laying its eggs in the stems. The same marked restriction to certain localities or portions of orchards observed in earlier years was noted the past season. This pest is an extremely local one and operations against it should be regulated accordingly.

The most evident signs of the insect's presence are the sticky buds, the brown, blasted appearance of the blossom buds and an unusual drop of bud scales followed later by small, crinkled, spoon-shaped leaves. In the earlier part of the attack a slender, dark brown insect only about one-twentieth of an inch long may be seen upon the opening of the fruit buds and especially in crevices between the stems of the partly expanded fruit clusters.

In the case of badly infested orchards it is advisable to delay the winter treatment with lime-sulphur wash for San José scale until the buds have started and then add to this preparation a

¹ 1913 N. Y. State Mus. Bul. 165, p. 70-74.

tobacco extract such as black leaf 40, 1 to 800. This will destroy many of the thrips before they have had an opportunity to find shelters in the buds which have opened just sufficiently so that they can make their way down between the stems of the young fruit. Later, if the insects are numerous, it is advisable to spray with the tobacco extract at the above given strength just as soon as the young pears have separated sufficiently so that the thrips at the base of the stems are exposed. This application, in particular, should be directed so that the spray will be driven down into all the crevices of the fruit clusters. Another spraying with the tobacco extract may be advisable after the blossoms fall. This insect works so rapidly and seeks shelter so persistently that timeliness is a prime essential of the spraying.

False red bug (*Lygidea mendax* Reut.). This pest appears to be on the increase, and last summer was so numerous in an orchard near Poughkeepsie as to deform and practically ruin one-third of a good crop of greenings. Fortunately for the owner there were many apples on the infested trees, and the dwarfing and dropping of so much fruit was not so serious as it might have been under other conditions. The red bug injury, according to observations made by Mr C. S. Hubbard, begins on the fruit produced by the late blossoms in the center of the tree, and from these shelters the insects gradually work outward. The young apples are frequently pierced to the core. As they develop, depressions with pithy centers extending deep into the tissues may be noted and there is a marked irregularity in the shape; many of the apples are dwarfed and drop about midsummer. The insects rarely attract notice; the young bugs are bright red in color and shelter themselves largely in curled leaves, producing conditions resembling a serious plant louse infestation and with ill-defined, brown spots on the leaves, suggestive of sun scald, or on tender foliage there may be a discoloration resembling that produced by the four-lined plant bug, *Poecilopsus lineatus* Fabr., on currant leaves. Small apples are seriously affected by the feeding punctures as described above, the earliest evidence of injury being a slight exudation accompanied by a local discoloration and hardening. The full-grown bugs are shy and not easily captured.

Both of the red bugs are about one-quarter of an inch long and have the same general shape as the common and well-known tarnished plant bug, *Lygus pratensis* Linn. They may be easily recognized by their red color, the young being a brilliant red and somewhat resembling large plant lice, except for the absence

of the conspicuous cornicles or so-called honey tubes. The adult red bug may be recognized by the sprinkling of fine, whitish scales on the head, thorax and wing covers, the dark or fuscous area anteriorly on the pronotum and the absence of a fuscous margin posteriorly — characters absent in the adult lined red bug. Practically speaking, there seems to be little need of differentiating between the two species, since their habits are so similar and control measures almost identical.

These two plant bugs are widely distributed in New York State and appear to have spread to the apple from the thorn apple or *Crataegus*. The eggs are laid in late June or during July in the bark, usually two year old wood, and do not hatch until after the leaves of the fruit buds are open, in the case of the red bug; those of the false red bug hatching about a week later. The young pass through several stages, those of the two species resembling each other closely and attaining maturity in June.

These pests appear to be very susceptible to tobacco preparations, since experiments have shown that a black leaf extract diluted 1 to 65 or black leaf 40, 1 to 800, will destroy the young. The first application should be made just before the blossoms open and the second with the usual spray for the codling moth, the only additional expense being the addition of the tobacco extract to the poisoned fungicide usually employed. Where practical it is suggested that the winter application for San José scale be delayed as late as possible and three-fourths of a pint of black leaf extract added to each 100 gallons for the purpose of destroying red bugs as well as the San José scale. This treatment would also be very effective in checking plant lice. It is quite possible that the tobacco added to the codling moth spray would, under most circumstances, be all that would be necessary to prevent material injury by either of these pests.

Comparative descriptions of the adults of these two species with observations upon their habits are given in the 26th report of the State Entomologist (Museum Bulletin 147) and Prof. C. R. Crosby of Cornell University has published a detailed account of the two forms, illustrating the various stages, in Bulletin 291 of the Cornell University Agricultural Experiment Station. The readers desiring additional details are referred to these two publications.

Pear Psylla (*Psylla pyricola* Riley). The pest was rather abundant last July in orchards in and about Barker, especially where there had been some slackness in treatment. The foliage in

some orchards was seriously blackened as a result of sooty fungus developing in the honeydew exuded by the Psyllids. There is decidedly less injury, as a rule, by this insect in the Hudson valley than in western New York, though it occasionally becomes excessively abundant locally in the eastern part of the State.

The efficacy of a late spraying with a standard lime-sulphur wash for the control of this insect was well shown in a previously neglected and consequently badly infested orchard near Athens. Psyllas had been numerous and at the time of spraying (April 17th-19th) most of the adults had disappeared and the small, yellowish eggs were abundant on many twigs. The one spraying at this time practically annihilated the pest in that orchard, only a very few insects being seen throughout the summer.

The control of this insect is greatly aided by keeping the rough bark scraped from the trunks of the older trees, thus materially reducing the number of winter shelters for the "flies." Summer applications of a contact insecticide, such as a tobacco extract, are sometimes necessary.

Plant lice were somewhat abundant, especially on young trees, early in the season, probably because of the cool, backward weather. In some instances the foliage on shoots 10 to 12 inches long of small trees was nearly covered with the pests. Mr W. H. Hart of Arlington reports plant lice almost absent from young trees which had been very badly infested the preceding season and had then been thoroughly sprayed with a whale oil soap solution used at the rate of 1 pound to 12 gallons of water.

A number of natural enemies were observed preying upon plant lice, such as the black grubs of the two-spotted lady-beetle, *Adalia bipunctata* Linn., the white-tufted larvae of *Hyperaspis signata* var. *binotata*, and the varicolored larvae of Syrphid flies, were very serviceable in checking the injury, especially as the weather became warmer about June 20th or a little later. In some instances it was found advisable to spray with contact insecticides rather than to rely upon the beneficial action of natural agents.

San José scale (*Aspidiotus perniciosus* Comst.). As a rule this insect has not been causing appreciable injury in orchards systematically sprayed, though occasionally neglected trees become very badly infested. The experience of the past season shows that even under such conditions, one thorough application will check the pest in a most effective manner.

The Entomologist supervised the spraying of a neglected and

badly infested pear orchard early in April. One of the standard concentrated lime-sulphur washes was used and an effort made to do very thorough work, though owing to the softness of the ground, the height of the trees and a moderately high wind, conditions were not so favorable as they might have been. Some of the trees were in such bad condition that large limbs were dead or nearly so as a result of the infestation, and many of the smaller limbs were fairly incrustated with living scale. The one treatment resulted in practically cleaning up the pest.

An examination last August on another farm showed an equally satisfactory result under different conditions. Owing to certain unfavorable developments the preceding year, it was impossible to spray the apple orchard under consideration and, to make matters worse, the treatment of the preceding year or two had not been any too thorough. As a consequence, in August 1912 many of the trees were very badly infested, the limbs being literally covered with scale and a number of branches dying. Last fall the pest was so prevalent that the owner even refused to sell the fruit for cider apples. This orchard was sprayed last fall and again in the spring with a standard lime-sulphur wash and, as a result of the treatment, very little scale was to be found last August, aside from a scattering infestation on an occasional limb. Most of the fruit was so clean that there was no reason for suspecting the presence of the insect. These results were secured on moderate sized apple trees about twenty years old and with a trunk diameter of 6 to 8 inches.

Several small four-winged parasites became exceedingly abundant in a number of badly infested orchards in various parts of the State. A personal investigation in several Schodack, Stuyvesant and Poughkeepsie orchards showed these beneficial insects generally distributed and in several localities very abundant. The latter was confirmed by an examination of representative limbs. One twig only an inch in length and five-sixteenths of an inch in diameter had 184 exit holes. In another case it was estimated that 85 per cent of the scales had been destroyed by parasites, though owing to the natural variation in the degree of infestation and the fact that parasitism is not easily ascertained prior to the emergence of the adults, it was impossible to do more than make an approximate estimate. The appearance of parasitized scales is shown on plate 15, figure 1.

A tabulation of our rearings shows *Prospaltella perniciosi* Tower to be a well-distributed and rather abundant

parasite, it emerging from collected material from the latter part of November into the following February and constituting over 85 per cent of the total parasites bred. The next species in importance is *Aphelinus fuscipennis* Howard, which appears to have an equally wide distribution and prolonged breeding season and constituted about 12 per cent of the total parasites reared. *Coccophagus immaculatus* Howard was obtained in small numbers, and the same is true of *Chiloneurus* species and *Psyllaephagus* species. The last named, however, was reared in late January and early February from only one lot, in unusually large numbers, which latter would seem to indicate that under certain conditions it might be much more efficient than the two preceding.

It is certain that parasites of the San José scale were much more abundant than has been observed before in New York State. Several of these small forms are generally distributed, and in 1900 the late Dr J. B. Smith expressed the belief that *Aphelinus fuscipennis* Howard, a species which he reared in numbers, was established in New Jersey wherever San José scale had obtained a foothold. The same year the late Prof. W. G. Johnson reared thousands of this little insect from infested twigs collected in Maryland orchards and advised correspondents not to burn branches and twigs from infested trees during the fall and winter and thus allow these minute insects an opportunity to escape in the spring. This is sound advice and we would recommend such procedure in all cases where parasites are found to be present in any numbers.

The fact that parasites of the San José scale have been so abundant the past season, by no means justifies the abandonment of spraying, or even the relying in considerable measure upon the good offices of these insects. It should be remembered that in most cases the parasites become numerous enough to control the scale only after the trees have been seriously injured. The middle portion of one orchard, approximately a third of it, where parasites were abundant, had been almost ruined by San José scale and severe injury was not uncommon in others. The probabilities are at least fair that the parasites will not be so abundant another season and they may not render any material aid in controlling the scale for another decade. Their appearance in extraordinary numbers the past season may have been due in part at least to unusually favorable climatic conditions. We have repeatedly investigated earlier statements to the effect that the San

José scale was dying out locally and, prior to last summer, were unable to find evidence of any material control through the agency of parasites. These small insects are sufficiently important so that their development should be carefully watched and an effort made to estimate their true value as natural checks. It should be remembered that these insects have been known to entomologists practically since the introduction of the scale in the eastern United States and the cases of material benefits resulting from their presence are comparatively few.

For the present at least, we would not hesitate to advise continued spraying for the control of San José scale, a treatment which in most cases is profitable, even though the trees are not badly infested; since if a lime-sulphur wash is used, valuable fungicidal effects are secured as well as protection from a number of insect pests.

Variegated cutworm (*Agrotis saucia* Hubn.). Under date of July 15, 1913 Mr J. A. Thompson, nursery inspector of Rochester, N. Y., forwarded specimens of this cutworm, accompanied by the statement that they were feeding on clover and fallen apples. Specimens of the latter were received and from one-half to two-thirds of the fruit, which attained 2 inches in diameter, were eaten away in a very irregular manner. There was no evidence to show that these cutworms, although known to be of climbing species, had ascended the trees and attacked the fruit while still hanging.

SHADE TREE PESTS

Elm leaf beetle (*Galerucella luteola* Müll.). The destructive work of this pest has been greatly checked in many localities during recent years, by thorough and systematic spraying. Indications early last spring were favorable for very severe injuries to unsprayed trees, as the beetles appeared early and fed vigorously. There was a period of exceptionally cool weather in June, the thermometer dropping to 40 degrees on the 9th, 44 on the 10th and to 47 on both the 8th and the 11th, the mean during this four day period being 64 on the 11th, 58 on the 10th, 54 on the 8th and 51 on the 9th, while the maximum was 80 on the 11th, 72 on the 10th and but 62 on both the 8th and 9th. It appears quite possible that this unseasonable weather coming at a time when normally egg production should be at its height, may have greatly checked the laying of eggs and resulted in a comparatively small number of larvae.

A marked restriction of severely injured areas was noticed in a number of places, due in some instances to very local causes and in others possibly to be accounted for by the sickly condition of the trees. It is well known that severe injury is likely to develop on weakened trees, and this was noted as in earlier years. It is not necessary to assume that these elms were special favorites with the insects, since the reduced vitality would, of itself, result in the production of much less than the normal amount of foliage, and an average infestation of the voracious grubs would make short work of the small leafage. This condition probably explains some of the local and severe injury which can not be accounted for in any other way. Such trees can be protected, though they require special care. It is a decided advantage to trim judiciously, so as to remove all the dead wood and promote a vigorous growth so far as practical and then protect the leaves by giving a very thorough spraying and, in extreme cases, more than one. The reduction in the numbers of this pest is probably only temporary and should not be construed as a justification for abandoning the spraying of earlier years.

The first essential in protecting shade trees is efficiency, the second, economy. Experience and modifications in apparatus have shown it to be possible to spray trees thoroughly and very rapidly and thus effect a material economy in the cost of treatment. The tendency now is to use the high pressure, a rather coarse nozzle and to avoid climbing so far as possible. The most efficient outfits are sufficiently powerful so that practically all the spraying is done from the ground at an enormous saving in both time and money. The most serious disadvantage of these outfits is the very high cost of the apparatus and the difficulty of controlling the stream on narrow streets. There is no question as to their utility and value on broad avenues, in parks or woodland areas.

English elm pouch gall (*Tetraneura ulmisacculi* Patch). This species, kindly determined by Miss Edith M. Patch, represents an addition, probably of English origin, to our fauna. The galls were found in small numbers July 17, 1913, on an English elm, *Ulmus campestris*, on the estate of S. G. Rosenbaum, Roslyn, N. Y. They were also found at Stamford, Conn. There was only a scattering infestation and no serious injury resulted.

The galls are pedunculated, oval sacks arising from the upper surface of the leaf half an inch to possibly an inch in diameter in the case of the larger deformations. They are smooth, bright yellowish



Fig. 10 English elm pouch gall (natural size, original)

green, appearing almost as if varnished and decidedly paler than the leaf, and as they age, assume variable purplish tints. The entrance to the gall is on the under side of the leaf and is guarded by pale, fuzzy hairs. Three or four galls frequently occur on a leaf, though Miss Patch has recorded as many as thirty-six. The interior of the gall is slightly ridged and inhabited by numerous plant lice. Technical descriptions of this species are given by Miss Patch (Me. Agric. Exp't Sta. Bul. 181, p. 216-19, 1910) to which the reader is referred for further details. This species presumably has a wide American distribution and can be controlled, if necessary, only by picking the infested

leaves early in June before the plant lice have begun to escape and burning them. This recommendation is practical only in the case of small trees.

Our most common elm gall is the cockscomb gall (*Colopha ulmicola* Fitch) which is sometimes so abundant on American elms as to distort the foliage badly. The much rarer slippery elm gall (*Pemphigus ulmifusus* Walsh) is confined to the red or slippery elm and is easily distinguished from the more recent introduction by its larger size and particularly by its occurrence only on a very characteristic food plant. The smell of the leaves is often sufficient to identify the leaf and, secondarily, the gall.



Fig. 11 Slippery elm pouch gall (natural size, original)

False maple scale (*Phenacoccus acericola* King). There were a number of inquiries concerning this insect during the summer, though in a general way it was not so abundant and injurious as in earlier years. A very abundant infestation was located September 24th on certain trees at Mount Vernon, a little east and south of the New Haven Railroad station. Some of these trees were so badly infested that practically every leaf bore 6 to 25 of the conspicuous cottony masses indicating females, while the portions between the adult insects were thickly spotted and in some instances practically coated with the numerous yellowish young. The trunks of these trees were liberally plastered with the white cocoons of the male and, in some places, fairly covered with yellowish masses of the young. This local outbreak was evidently the culmination of a series of generations and apparently very restricted in extent.

A number of small parasites and the beneficial ladybeetle, *Hyperaspis signata* var. *binotata*, were obtained from this material. A peculiar obscure, yellowish gray Syrphid larva was observed among the scale insects; later it transformed to a somewhat similar though stouter puparium from which the imago of *Baccha fascipennis* Wied. was obtained. Several other natural enemies are known to live at the expense of this scale insect.

The sugar maples, although so very badly infested with this scale insect, did not seem to be seriously injured, aside from a somewhat thinner, paler foliage. This latter development came so late in the season, September 24th, that it probably would not have any very material effect upon the vitality of the tree.

Spruce bud scale (*Physokermes piceae* Schr.). Specimens of Norway spruce infested by this insect were received June 12th from Mr Arthur Dummett, Mount Vernon, N. Y. An examination of one twig evidently representing a condition on a portion of a tree or perhaps entire trees showed this scale insect to be numerous at the base of the branches or new growth. The peculiar budlike enlargements contained numerous pale purplish, broadly oval eggs which would probably hatch the latter part of July. One scale was infested by parasites. Specimens of this insect were received from other localities and in several instances from trees which were also infested by the spruce gall aphid, *Chermes abietis* Linn.

This species was observed by us in 1908,¹ though at that time it was confused with the spruce gall aphid. It occasionally becomes exceedingly abundant as recorded by Mr B. N. Gates.² He found it so numerous on spruces at Amherst, Mass., that the honeydew attracted swarms of bees, and these in turn called his attention to the infestation. Mr A. T. Gillanders³ has observed this insect very commonly on sickly Norway spruce in England, especially those infested by the spruce gall aphid. This scale insect is subject to attack by a number of parasites and only occasionally becomes sufficiently abundant to cause material injury.

Tulip tree scale (*Toumeyella liriodendri* Gmel.). This, the largest of our native scale insects, is confined to the tulip tree and occasionally becomes very abundant and injurious in the vicinity of New York City. Several complaints concerning this insect were received during the past season and our attention has been frequently called to the pest in earlier years.

This insect winters in New York State in a partly grown condition, the young being from one-quarter to one-half full size, closely attached to the branches, usually on the under side. They have a very dark brown, almost black color, and on that account generally escape attention. Observations the past season show that the young begin to appear at Flushing August 16th, while specimens received September 4th from Tarrytown showed some young established, others crawling and many still issuing. This latter process evidently continues till the latter part of September. The full-grown females may be observed in August. They measure about one-third of an inch in diameter, are very convex and light brown in color. Badly infested trees have the leaves smeared with honeydew excreted by the insects; the sooty mold developing therein discolors the foliage below. There is also a rather characteristic sourish odor about badly infested trees or twigs.

One of the easiest methods of keeping this pest in check on small trees is by scraping off the scales or brushing them from the under side of the branches with a stiff brush, about the middle of August or even a little earlier. Thorough spraying of infested trees in the spring with a kerosene emulsion, the standard formula diluted with 4 parts of water is a very effective treatment. Spray as late as practicable since the insects are presumably more susceptible then.

¹ N. Y. State Mus. Bul. 134, p. 55.

² 1909 Econ. Ent. Jour. 2:466-67.

³ 1908 Forest Entomology, p. 228-29.

FOREST TREE PESTS

Forest tent caterpillar (*Malacosoma disstria* Hübn.). The depredations of this species recorded in 1912 have been continued on a more extended scale the present season. The caterpillars defoliated a number of acres of woodland in Roslyn and Jericho on Long Island, were abundant in Putnam and southern Dutchess counties, attacked maples at Granville, Elizabethtown and Ogdensburg and defoliated extensive tracts of poplar in Franklin and Clinton counties.

The last of May and early in June many of the oaks in Roslyn and Jericho were defoliated, a few of the caterpillars being only half grown, most of them fully developed, and some, particularly in the warmer, more advanced situations, had commenced to spin their cocoons. The injury in this locality was practically confined to the oaks. At Granville, Elizabethtown and Ogdensburg the caterpillars were most numerous upon the sugar maple, while in Franklin and Clinton counties there was a marked preference for the poplar (*Populus tremuloides*), particularly the tops of trees 30 feet or more in height. The feeding, in certain cases at least was confined to the vicinity of water. The aspen or poplar was the preferred food plant in this section, though willow, when standing near stripped trees, was eaten to some extent. The pin or bird cherry was partly defoliated and evidently eaten by the caterpillars only when forced by hunger. Elms and *Cornus* close to poplars were badly eaten or nearly stripped, respectively. The red maple and birch were nearly exempt from injury, unless next to defoliated trees. Pine, balsam and spruce, in fact all coniferae observed, were practically unharmed, though numerous cocoons were to be found among the needles (June 27th). The area of serious injury in this section begins at about Rainbow lake, Franklin county, and extends eastward through Clinton county nearly to Lake Champlain.

Natural enemies were observed at work both at Rainbow lake and Chazy lake. At Rainbow lake a large Carabid beetle was taken on a tree trunk some 4 feet from the ground. It was there evidently in search of caterpillars. Numerous Tachinid and Sarcophagid flies were observed about the caterpillars and were presumably ovipositing thereon. A number of Hymenopterous parasites, particularly *Pimpla* species, were observed on the cocoons at Chazy lake.

The probabilities of continued injury another season can best

be determined by examining the trees during the fall or winter for the characteristic brown egg belts about half an inch long, encircling the smaller twigs. Wherever these are numerous there is very good prospect of serious depredations another season. The low value of timber and land in the Adirondacks precludes the adoption of comprehensive measures for the control of the pest. This does not apply to the more highly valued holdings in the vicinity of New York City and in such places it may be advisable to make provision for early spring spraying of the woodland areas where the eggs of this insect are numerous. The work against the gipsy moth in eastern Massachusetts has shown that fairly open woodland can be sprayed at the very moderate cost of \$6.50 an acre with the modern high pressure outfit so extensively used in eastern Massachusetts. This equipment, while costly, is really the most economical where areas of any size are to be sprayed, since the high power and special nozzle renders climbing unnecessary and thus effects a great saving in time.

Locust borer (*Cyrtene robiniae* Forst). Injuries by this common borer have attracted an unusual amount of attention, and local investigations disclosed serious damage. It is rare to find any number of black locust trees in New York State not infested by this borer though, as a rule, the damage is confined largely to dying branches and the deforming of old trees.

The past season our attention was called to a hedge row at Salamanca so badly infested that a number of young trees broke off in moderate to high winds. Investigations on Long Island showed numerous trees with limbs killed by this insect. A more serious condition was noted east of Poughkeepsie, in that here and there good sized trees had apparently succumbed to the activity of this pest, while many others were in more than the usual bad condition. The most striking injury was at Millbrook where nearly one acre of young transplanted locusts had been killed, probably the present year, by this insect. The trunks ranged in diameter from 1 to $2\frac{1}{2}$ or 3 inches and were repeatedly girdled and well riddled by the galleries. There were a few larger trees with a diameter of 4 inches or over in this area which were not very seriously affected. The general killing of these trees was evidently due to an unusual increase in the borers and, as a consequence, the numerous larvae were literally compelled on account of the lack of space to girdle the trees repeatedly in making their galleries. The outbreak was evidently one of those periodic increases in the

number of insects, which are not readily explainable. The mere fact that this planting was in a section where the locust borer was generally abundant and injurious should have served as a warning regarding the possible outcome of such an undertaking.

This latter case is undoubtedly an extreme one, and yet it is one of the probabilities which must be faced by those contemplating extensive plantings of this valuable tree.

The parent of the locust borer, as most people realize, is a rather slender, black beetle less than three-quarters of an inch long and very prettily marked with golden yellow. It may be found in considerable numbers feeding on goldenrod blossoms. The females deposit their oval, whitish eggs here and there in crevices of the bark and the young grubs spend the winter in the outer part of the living inner bark. The larger grubs, as is well known, when abundant may riddle the inner portion of the trunk with galleries about one-quarter of an inch in diameter and running mostly with the grain of the wood.

As suggested above, from our present state of knowledge, it appears unwise to plant the black locust in sections where this borer is abundant and destructive. Plantings already established should be carefully watched for early indications of injury, most easily detected during the spring and early summer by bleeding and ejected borings. Very badly infested trees or parts of trees should be cut and destroyed before the first of August, in order to prevent the insects maturing. It is perhaps unnecessary to add that the general adoption of this plan would probably result in a very satisfactory control of the borer. Doctor Hopkins states that the hibernating larvae may be destroyed by spraying the trunks and branches with a strong solution of kerosene emulsion. Ordinarily, in our opinion it would be safer to make this application in the spring and not later than the first of April. Pure kerosene, petroleum or petroleum compounds may result in injury to the trees unless used with much care. Experiments at Salamanca last July showed that the nearly full-grown grubs could be killed or driven from their burrows by applications of a creosote preparation which was said to be harmless to the trees.

Some trees appear to be more resistant to attack than others, and it has been suggested by Doctor Hopkins that work along this line might be attempted in the case of the black locust and an effort made to obtain borer-resistant trees, either by cross-breeding or through propagation by cuttings.

Spruce aphid (*Mindarus abietinus* Koch.). Specimens of the work of this aphid were received through the State Conservation Commission under date of June 14, 1913 from Mr John Nill of Star Lake, N. Y. The balsam shoots had the tips to a length of 1 to 2 inches badly curled and twisted, while the foliage as a whole was very sticky, indicating an abundant earlier infestation by this plant louse. Mr Nill stated that the infested trees upon his place were all young and thrifty and not more than 20 years old. Some are uniformly infested all over and others only in part, there appearing to be no difference between those standing in groups and isolated trees. The shoots submitted for examination had numerous Syrphid larvae and practically no plant lice, indicating that the attack so far as these particular trees are concerned, is at an end. The affected balsam tips, however, will probably wither and perish.

Specimens of the work of this aphid were also received under date of June 9th from Lake Clear, N. Y., through Mr George L. Barrus, state forester. These latter tips bore a number of 15-spotted lady beetles, *Anatis ocellata* and practically no aphids, indicating that natural enemies were checking the pest early.

MISCELLANEOUS INSECTS

Drug store beetle (*Sitodrepa panicea* Linn.). The stout, light brown beetle, only about one-eighth of an inch long and its white, curled grub is well known to entomologists as a feeder upon a considerable variety of substances, such as flour, meal, breakfast foods, condiments, roots and herbs and animal matter. It has even been known to colonize itself in a human skeleton which had been dried with the ligaments on, and has been recorded as perforating tinfoil and sheet lead. Only two months are required to complete the life cycle, and in warm buildings breeding may be continuous throughout the year.

Last summer a ledger bound in half morroco was received from a local manufacturing company, with an inquiry as to the source of certain insect injury. It developed that the sample was from a California dealer who had held some of the books in storage for a period of about fourteen years. The infested ledgers were fumigated prior to their return to the manufacturer in the same manner as is customary with citrus trees in that section. An examination resulted in our finding nothing alive. It was seen that the insects confined their operations largely to making sinuous galleries in the

morocco, occasionally invading the sheepskin and working mostly on the inner face of the leather, partly on account of the protection afforded and presumably attracted somewhat by the glue used in binding the book. Attacks of this kind are evidently unusual and can generally be avoided by examination from time to time and fumigation, if necessary, with either carbon bisulphid or hydrocyanic acid gas.

Mason bee (*Osmia felti* Ckll.¹). Very little is apparently known concerning the habits of this genus, though the related leaf cutter bees, *Megachile*, commonly attract notice because of the characteristic circular or nearly circular pieces so frequently cut from rose and other leaves and used by these insects in the construction of larval cells, the latter being placed end to end and located sometimes in the ground, usually in burrows in the wood, and even in crevices such as those occurring between shingles in a bunch or on a roof.

A number of small bees were observed June 18, 1902, around a circular entrance in the thick bark



Fig. 12 Galleries of a mason bee, *Osmia felti*, in hard pine (natural size, original)

of a hard pine at Karner, and on capturing specimens and submitting them to Prof. T. D. A. Cockerell, an authority on this group, they were described by him as new. An examination of the galleries showed a circular entrance

¹ 1911 Ent. News, 21:18.

with a diameter of nearly a quarter of an inch, leading into a complex series of galleries (figure 12), some of which were occupied by a number of cells. The latter are not lined by leaves as in the genus *Megachile*, the separations apparently being composed mostly of comminuted particles of bark. The individual cells are evidently divided much as in *Megachile*, and the larvae, on attaining maturity, spin yellowish brown, oval cocoons occupying the entire diameter of the gallery and with a length of approximately five-eighths of an inch. A parasite, *Leucopsis affinis* Say, was reared from wood containing the cells of this insect.

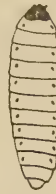
White-winged Bibio (*Bibio albipennis* Say). Dirty yellowish gray larvae of this species were found March 26, 1900 by Mr W. F. Smith, White Plains, N. Y., in stable manure spread the preceding fall on flower beds. The larvae pupated in oval cells in the earth, and hosts of adults emerged April 18th. The black flies, with a length of only three-eighths of an inch, have white wings when they first appear above ground. These soon become transparent. This insect is a common species about gardens and orchards in early spring.

Larva. Length about 1.3 cm, diameter 2 mm. Head reddish brown, strongly chitinized, the dorsum with a sublateral seta near the anterior third, a little below this there being apparently a rudimentary eye. Labrum subquadrate, rounded anteriorly; mandibles moderately large, subtriangular, rounded, bidentate. The maxillae appear to be represented by a pair of ventral, irregularly ovate sclerites. The labium is subcordate. The body is a dirty yellowish gray, rather strongly annulate and composed of 12 segments, the anterior 4 being divided into 3 annuli, the divisions on the other segments less marked. There is at the posterior third of the segments, on the middle annulus in the anterior ones, a transverse row of short, stout, fleshy processes, which latter are somewhat produced laterally and on the posterior segment. The skin is coarsely shagreened. On the first body segment there is a moderately well-developed brown spiracle, rudimentary ones being seen upon succeeding segments to the twelfth, which latter has a well-developed sublateral spiracle on the anterior fourth. The posterior extremity is obliquely truncate, excavated, the anus being guarded by two broadly oval, subdorsal flaps, a pair of subventral triangular processes and a ventral rounded lip.

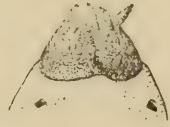
The use of ground, unslaked lime or naphthalin is advised by Collinge for the destruction of larvae of the allied *Bibio marci* Linn. in leaf mold, in which they occur.

Bolitophila cinerea Meign. Numerous white, black-headed larvae of this species were found in the base of a decaying, probably fungous-infected, birch stump at Albany in March, the adults issuing early in April. The larva appears to be unknown and is described below.

Larva. Length 4 mm. Head shining jet black. Body white, with jet black tubercles. The head is moderately large, having a width fully two-thirds that of the body and with moderately well-developed triarticulate or possibly quadriarticulate palpi. Each antenna is supported upon a broad base surrounded by a narrow ring of fuscous chitin, possibly the first segment; the next segment is cylindrical, tapers slightly and has a length one-half greater than its diameter; the third segment is conical and about one-third as long as the preceding; the terminal segment is very slender, about two-thirds the length of the preceding. Body stout, apodous, the segments distinct; posterior extremity tapering slightly to a somewhat narrowed, subtriangular terminal segment. Ventral surface, the margins of the abdominal segments broadly banded with transverse lines of fine, chitinous points resembling somewhat those of *Miastor*.



x 6



x 20

Fig. 13 *Bolitophila cinerea*; larva enlarged, head still more enlarged (original)

PUBLICATIONS OF THE ENTOMOLOGIST

The following is a list of the principal publications of the Entomologist during the year 1913. The titles,¹ time of publication and a summary of the contents of each are given. Volume and page number are separated by a colon.

The Gall Midge Fauna of Western North America. Pomona College Journal Entomology, 4:753-57, 1912

A list of species with food habit records so far as known.

Studies in Itonididae. New York Entomological Society Journal, 20:236-48, 1912

Two new genera, *Neocatocha* and *Neptunimyia*, were erected and the following new species described: *Neocatocha marilandica*, *Neptunimyia tridens*, *Porricondyla dorsata*, *P. juvenalis*, *Contarinia coloradensis*, *Thecodipolsis dulichii*, *Dicrodiplosis antennata*, *D. californica*, *D. helena*, *Itonida aphidivora*, *I. putrida* and *I. aprilis*. A sex is described or biological observations given of the following: *Rhabdophaga aceris* Shim., *Phytophaga ulmi* Beutm., *Thecodiplosis ananassi* Riley, *Itonida resinicola* O. S. and *Cecidomyia ocellaris* O. S.

Notes. New York Entomological Society Journal, 20:292-93, 1912

Brief notes are given on the fiery ground beetle, *Calosoma calidum*, *Neuroterus saltatorius*, and two-spotted lady beetle, *Adalia bipunctata*.

Prevention of Mosquito Breeding. American Society Civil Engineers Proceedings, 39:153-54

A brief discussion of certain phases of mosquito control.

Fly Campaign. West Winfield Star, p. 4, January 31, 1913; Democratic Register (Ossining) February 1, p. 4; Whitney Point Reporter, February 13, p. 4

A brief note urging a serious fly campaign the coming season.

Some Orchard Insects. Department of Agriculture, Bulletin 42, 1912, p. 102-3

Summary of methods for controlling several of the more important insects.

Household Entomology. Department of Agriculture, Bulletin 42, 1912, p. 109-10

Brief directions are given for controlling the chief insect pests of the house.

¹ Titles are given as published. In some instances articles appearing in a number of papers have been given different titles by the various editors.

Save the Hickory Trees. New York Times, New York Herald,
March 3, 1913

A summary statement of conditions about New York City advising the cutting of infested hickories and the burning of the bark.

Cystodiplosis eugeniae n. sp. Entomological News, 24:175-76, 1913

Description of a midge reared from a hairy, spherical leaf gall on *Eugenia buxifolia* collected at Key West, Florida.

Insect Enemies of Trees and Shrubs. Arbor Day Annual, New York State Education Department, 1913, p. 23-28

A brief, popular, illustrated account of some of the more injurious or common shade tree and shrub insects.

Save the Trees. Northern Budget (Troy, N. Y.), April 13, 1913,
p. 2

A summary account of elm leaf beetle conditions. Spraying is advised in most localities.

Gall Midges in an Aquatic or Semiaquatic Environment. New York Entomological Society Journal, 21: 62-63

Annotated list of gall midges occurring under such conditions.

The Caterpillar Pest. The Freeman's Journal (Cooperstown, N. Y.), April 23, 1913

Brief warning notice of probable injury by the apple tent caterpillar, *Malacosoma americana* Fabr., with directions for control.

Itonida anthici n. sp. Economic Entomology Journal, 6:278-79, 1913

The gall and all stages of this midge occurring on bald cyprus, *Taxodium distichum* are described.

Phytonomus meles Fabr. Economic Entomology Journal, 6:283-84,
1913

A record of the distribution and abundance of this weevil.

Bleeding Trees. Economic Entomology Journal, 6:285-86, 1913

A Dipterous larva, probably *Ceratopogon*, is recorded as causing bleeding from wounds in maple and elm trees and described.

Spraying in the Hudson Valley. New York State Fruit Growers Association Proceedings, 1913, p. 267-75

A record of work in controlling the codling moth and observations upon trees sprayed with a miscible oil.

Self-Boiled Lime Sulphur. Rural New Yorker, April 26, 1913,
72:600

Gives data on the value of summer sprays for the control of San José scale.

White Grubs. Troy Times, April 29, 1913; Poughkeepsie Evening Star, May 9; New York Farmer, May 8, p. 4

Brief resumé of white grub conditions with observations on several natural enemies.

Spraying for the Codling Moth. Recorder (Catskill), May 9, 1913, p. 7

A summary of results obtained with one spray and directions for effective work.

Two Rose Pests. Florist's Exchange, May 10, 1913, 35:1122

Early spraying with soap or tobacco extract advised for aphids and leaf hopper, *Typhlocyba rosae* Linn.

Fly Control. New York State Education Department, State Museum, p. 1-9, May 1913

A brief, summary discussion of the house fly and methods of controlling it.

Caterpillar Pests. Northern Budget (Troy), June 1, 1913, p. 5

Brief, popular notice of the apple tent caterpillar and the forest tent caterpillar.

Gouty Pine Midge (*Itonida inopis* O. S.) Economic Entomology Journal, 1913, 6:331

A brief record of abundance and injuries by this midge at Karner, N. Y.

Orchard Insect Pests. New York Farmer, July 10, 1913, p. 5

Brief, practical accounts of the San José scale, oyster scale, codling moth, plant lice and red bugs.

Mosquito Control. American Society of Civil Engineers Transactions, 1912, 76:771

A brief note calling attention to the importance of roadside pools and making suggestions regarding the treatment of catch basins and of general mosquito breeding areas.

Notes on Care of Fruit Trees, Bushes and Vines. Correct Methods of Preserving Fruit, Muncie, Indiana, 1913, p. 36-40

Formulas for standard insecticides and fungicides.

Remedies and Preventives for Plant Enemies and Diseases. Correct Methods of Preserving Fruits, Muncie, Indiana, 1913, p. 41-54

Spraying calendar for orchard trees, small fruits, shade trees, garden crops and the flower garden.

Insecticides and Fungicides. New York State Museum, Handbook 18, p. 1-24, May 1913 (issued August 1913)

Formulas for the principal insecticides and fungicides (revised from earlier editions).

Descriptions of Gall Midges. New York Entomological Society Journal, 21:213-19, 1913

A new genus, *Astrodiplosis*, is erected and the following species are described: *Winnertzia aceris*, *Camptomyia tsugae*, *Dasyneura cercocarpi*, *D. parthenocissi* and *Astrodiplosis speciosa*.

Miscellaneous Notes. New York Entomological Society Journal, 21:273-75, 1913

Drosophila repleta Woll. was reared from a jar containing galls of *Asphondylia conspicua* O. S. received from Highspire, Pa. The larval habits of *Phormia regina* Meign. and *Sarcophaga georgina* Wied. are summarized. A species of *Seius* is recorded on *Helobia punctipennis* and the work of *Platypus punctulatus* Chap. on mahogany in a local lumber yard noted.

Drought and Insects. Albany Evening Journal, p. 12, September 10, 1913; Albany Argus, September 12, 1913

A brief outline of shade tree conditions with suggestions for the better protection of elms another season.

Three New Gall Midges. Canadian Entomologist, 1913, 45:304-8

The following new species are described: *Karschomyia cocci*, *Mycodiplosis insularis* and *Clinodiplosis examinis*.

Table of Hickory Leaf Gall Midges. Brooklyn Entomological Society, Bulletin 8:98-99, 1913

A key for the separation of the species based on larval and gall characteristics.

28th Report of the State Entomologist on the Injurious and Other Insects of the State of New York, 1912. New York State Museum Bulletin 165, p. 1-264, 1913 (issued October 1913)

Contents

	Page		Page
Introduction	5	Use of oil on dormant trees....	83
Injurious insects.....	13	Notes for the year.....	93
Codling moth.....	13	Fruit tree insects.....	93
Hessian fly.....	31	Forest insects	99
Fall army worm.....	42	Miscellaneous	104
Elm leaf beetle.....	47	Publications of the entomologist.	113
White grubs and June beetles.	56	Additions to collections.....	120
Hickory bark borer.....	63	Appendix: a study of gall	
Pear thrips	70	midges	127
Queen blow fly.....	75	Explanation of plates.....	227
Georgian flesh fly.....	80	Index	255

ADDITIONS TO COLLECTIONS, OCTOBER 16, 1912- OCTOBER 15, 1913

The following is a list of the more important additions to the collections:

DONATION

Hymenoptera

- Lophyrus abbotii* Leach, Abbott's pine sawfly, larvae on pine, October 1, G. W. Crawford, Ballston Spa
- Janus integer* Norton, currant stem borer on currant, February 21, F. R. Lossoe, Troy
- Kaliofenusa ulmi* Sund., European elm leaf miner, larvae on elm, June 4, F. A. Smith, Ticonderoga
- Hylotoma pectoralis* Leach, birch sawfly, larvae on birch, July, F. Chase, Loon Lake
- Trichiosoma tibialis* Steph., European hawthorn sawfly, cocoon on rose, November 27, England. Through State Department of Agriculture. Same, cocoon on barberry, February 27, Flushing. Through State Department of Agriculture
- Aylax pisum* Walsh, gall on *Lygodesmia juncea*, September 30, E. Bethel, Denver, Col.
- Rhodites gracilis* Ashm., regal rose gall, galls on *Rosa blanda*, September 29, Mrs E. P. Gardner, Canandaigua. Through S. H. Burnham. Same, gall on rose, October 5, Mrs E. P. Gardner, Canandaigua
- R. globulus* Beutm., globular rose gall, gall on rose, October 5, Mrs E. P. Gardner, Canandaigua
- Myrmecocystus melliger* Llave, honey ant, adult, November 30, E. Bethel, Manitou, Col.

Coleoptera

- Eccoptogaster quadrispinosa* Say, hickory bark borer, larvae on hickory, January 28, J. James de Vyver, Bronxville
- Corthylus punctatissimus* Zimm., pitted Ambrosia beetle, adult on Rhododendron, September 13, C. H. Matthiessen, Irvington. Same, work, October 1, Charles Goodyear, Tarrytown
- Cryptorhynchus lapathi* Linn., mottled willow borer, grubs and work on poplar, June 18, William Hilligas, Rensselaer
- Lixus concavus* Say, rhubarb curculio, adult, March 31, J. R. Gillett, Kingston
- Pissodes strobi* Peck, white pine weevil, work on pine, January 20, E. H. Anderson, Mount Kisco. Same, larvae and work on pine, July 14, E. R. Pease, Poughkeepsie
- Galerucella luteola* Müll., elm leaf beetle, adults in house, May 28, Mrs A. C. Iceland, Middletown
- Nodonota tristis* Oliv., strawberry root worm, adult on strawberry, June 23, G. W. Tilly, Mechanicville
- Typhophorus canellus* Fabr., strawberry root worm, May 8, W. F. McDonough, Albany

- Chrysochus auratus* Fabr., gold gilt beetle, adults, November 6, J. J. Sullivan, Valley Mills
- Neoclytus erythrocephalus* Fabr., adult and work on ash, September 3, Hermann Von Schrenk, St Louis, Mo.
- Chion cinctus* Dru., banded hickory borer, adult, March 16, Mrs C. A. Van Deusen, Hudson
- Euphoria inda* Linn., bumble flower beetle, adult on apple, September 4. Through State Department of Agriculture
- Allorhina nitida* Linn., green June beetle, adult, July 3, W. D. Robertson, Roslyn, N. Y.
- Anomala lucicola* Fabr., light-loving grapevine beetle, adult, July 7, E. R. Farrar, South Lincoln, Mass.
- Lachnosterna fusca* Froh., white grubs infested by the peculiar fungus, *Cordyceps ravenelii* Berk., February 14, W. S. Miller, East Greenbush
- Sitodrepa panicea* Linn., drug store beetle, larvae, adults and work in account book, June 12, Saugerties Manufacturing Company, Saugerties
- Agrilus ? bilineatus* Web., two-lined chestnut borer, work on oak, October 30, C. A. Coffin, Locust Valley
- Melanophila fulvoguttata* Harr., spotted hemlock borer, larva on hemlock, December 2, H. W. Merkel, Scarsdale. Same, January 30, J. Downer, New York City. Same, bark of hemlock, May 16, C. L. Torbert, Syracuse
- Dicerca divaricata* Say, divaricated Buprestid, adult, June 20, Charles McMillan, Cambridge
- Alaus oculatus* Linn., owl beetle, adult, June 20, Charles McMillan, Cambridge. Same, beetle, July 28, E. V. Titus, Glen Cove
- Anatis 15-punctata* Oliv., 15-spotted lady beetle, adult on balsam, June 9, Lake Clear. Through State Conservation Commission
- Dytiscus harrisii* Kirby, water beetle, adult, September 17, Andrew Lacky, Johnsburg

Diptera

- Frontina frenchii* Will., adults, March 31, J. R. Gillett, Kingston
- Bibio albipennis* Say, white-winged Bibio, larvae on stable manure, March 28, W. F. Smith, White Plains
- Contarinia pyrivora* Riley, pear midge, larvae on pear, May 7, Thomas Albright, New Baltimore. Same, adult, September, F. V. Theobald, Wye, Kent, England
- Thecodiplosis ananassi* Riley, galls and larvae on Cypress, October 29, W. L. McAtee, Carlisle, Miss.
- Clinodiplosis florida* Felt, gall on oak, May 27, H. Garman, Louisville, Ky. Same, June 13, Charles Goodyear, Tarrytown
- Monarthropalpus buxi* Lab., box leaf miner, larvae on Box, August 21, Roslyn. Through Frost & Bartlett Co., Stamford, Conn.
- Hormomyia crataegifolia* Felt, coxcomb thorn gall, gall on *Crataegus*, August 12, Roy Latham, Orient Point
- Cincticornia pilulae* Walsh, oak pill gall, gall on oak, October 5, Mrs E. P. Gardner, Canandaigua. Same, October 24, W. L. Mc Attee, Riverdale, Md.
- Schizomyia coryloides* Walsh & Riley, clustered grape gall, gall on grape, August 8, Henry Shelter, Springwater

- Lasioptera corni* Felt, ocellate dogwood gall, gall on *Cornus*, September 21, A. Cosens, Toronto, Ont., Can.
- Dasyneura rhodophaga* Coq., rose gall midge, larvae on rose, July 16, Jackson & Perkins Company, Newark
- D. communis* Felt, galls on red maple, October 9, Mrs P. A. Rorty, Goshen. Same, May 27, H. Garman, Lexington, Ky.
- Rhabdophaga strobiloides* Walsh, pine cone gall, gall on willow, September 30, E. Bethel, Denver, Col.
- Camptomyia tsugae* Felt, larvae on hemlock, December 2, H. W. Merkel, Scarsdale

Siphonaptera

- Ceratophyllus gallinae* Schrk., hen flea, adults in hens' nests, May 29, Miss Marcia J. Sherwood, Barker
- Ctenocephalus canis* Curtis, house flea, adult, August 26, J. R. Heilman, Poughkeepsie

Lepidoptera

- Laertias philenor* Linn., pipe-vine swallowtail, larva on Dutchman's pipe, June 24, Charles Goodyear, Tarrytown
- Automeris io* Fabr., Io caterpillar, larvae on sweet clover, August 27, Miss Nina Carl, Breesport. Same, larva on corn, September 4, R. L. Cushman, Yonkers
- Halisidota caryae* Harr., hickory tussock moth, larvae on hickory, September 27, C. M. Reed, Sinclairville
- Peridroma margaritosa* Haw. var. *saucia* Hübn., variegated cutworm, larvae on apple and grass, July 15, Rochester. Through State Department of Agriculture
- Hadena fractilinea* Gr., lined corn borer, larvae on corn, June 19, C. B. Schoonmaker, Stone Ridge
- Xylina antennata* Walk., green maple worm, larva on linden, May 19, Miss Isabella M. Bartlet, New Hamburg. Same, larvae on apple, June 9, C. A. Clark, Castleton
- Papaipema* ? *merriccata* Bird, stalk borer, larvae on May apple, May 13, Hermann Von Schrenk, St Louis, Mo.
- Datana integerrima* Grote & Rob., black walnut caterpillar, larva on hickory, September 27, C. M. Reed, Sinclairville
- Schizura concinna* Sm. & Abb., red-humped apple caterpillar, larvae, July 8, J. R. Heilman, Poughkeepsie
- Hemerocampa leucostigma* Sm. & Abb., white-marked tussock moth, larvae on Wisteria, August 27, Miss Nina Carl, Breesport
- Malacosoma disstria* Hübn., forest tent caterpillar, eggs, December 17, J. J. Levison, Brooklyn. Same, larvae on oak, May 26, F. R. Appleton, Jr., Jericho. Through State Forester. Same, May 30, Charles Hechler, Roslyn, L. I. Same, cocoons, June 21, S. S. Terry, Elizabethtown. Same, larvae and cocoons on maple, June 23, Irving Wynkoop, Granville. Same, eggs on apple, September 5, J. A. Seely, Ogdensburg
- Cladonia atroliturata* Walk., imago, April 11, Peter Dunwald, Rio
- Anisopteryx pomataria* Harr., fall canker worm, males, females and eggs. December 3, Interstate Tree Treating Company, Mount Vernon
- Phigalia titea* Cram., imago on forest trees, April 11, Peter Dunwald, Rio

- Erannis tiliaria* Harr., ten-lined inch worm on linden, May 19, Miss Isabella M. Bartlet, New Hamburg
- Lagoa crispata* Pack., flannel moth, caterpillar on apple, September 18, H. W. Niles, Rye. Through State Department of Agriculture
- Harrisina americana* G. & M., cocoons on Virginia creeper, September 5, Mrs E. H. Cooper, Saratoga Springs
- Zeuzera pyrina* Linn., leopard moth, larva, May 31, A. G. Harris, Pelham. Same, larvae, September 4, Charles Goodyear, Tarrytown
- Sesia rhododendri* Beutm., *Rhododendron* clearwing, work and larvae on *Rhododendron*, September 29, H. W. Merkel, New York City
- Pinipestis zimmermanni* Grote, pine tip moth, work on Austrian pine, July 1, Westchester county. Through State Department of Agriculture
- Tinea granella* Linn., European wolf moth, larvae on sweet corn, November 13, F. W. Eberle, Albany
- Tmetocera ocellana* Schiff., bud moth, larva on apple, April 16, G. E. Ward, Ravena. Same, larva on apple, April 17, Theodore Haney, Ravena. Same, larva on plum, April 26, C. B. Jansen, Kingston. Same, larva on pear, April 28, Fred Hunt, Kingston. Same, April 30, H. B. Vincent, Old Chatham. Same, May 15, Clyde St John, Canajoharie
- Archips argyrospila* Walk., fruit tree leaf roller on apple, July 7, Collamer orchard, Hilton. Through State Department of Agriculture
- Tortrix fumiferana* Clem., spruce bud moth, larva, adult and work on spruce, July 6, George Lintner, Squirrel Island, Me. Same, adults on spruce, July 15, Mrs James T. Gardiner, Northeast Harbor, Me.
- Eulia politana* Haw., pine tube builder, work, November 12, J. J. Levison, Brooklyn
- Coleophora limosipennella* Dup., elm case bearer, work on elm, June 24, Charles Goodyear, Tarrytown
- Coptodisca splendoriferella* Clem., resplendent shield bearer, larvae and cases on apple, January 22, M. C. Albright, West Cocksackie
- Argyresthia thuiella* Pack., *Arbor vitae* leaf miner, pupae on *Arbor vitae*, June, Isaac Hicks & Son, Westbury. Larvae of same, October 4
- Phyllonoryter hamadryadella* Clem., white-blotch oak leaf miner, larval mines on oak, May 28, E. L. Torbert, Syracuse. Same, work on oak, October 22, J. James de Vyver, Mount Vernon

Corrodentia

- Caecilius pedicularius* Linn., nymph and adult, October 14, J. H. Gardner, Fort Covington

Hemiptera

- Philaenus lineatus* Linn., lined spittle insect on grass, June 23, Mrs M. S. Miller, Boonville
- Phylloxera caryaecaulis* Fitch, hickory gall aphid, galls on hickory, June 20, D. C. Pierce, Hamburg. Through State Conservation Commission. Same, July 10, H. S. Paine, Glens Falls
- Chermes pinicorticis* Fitch, pine bark aphid, adult on white pine, December 6, J. W. L. Coffin, Katonah. Through State Conservation Commission. Same, adult on pine, May 5, Brentwood. Through State Department of Agriculture. Same, June 18, Miss N. Neilson, Nyack

- C. abietis* Linn., spruce gall aphid, galls on spruce, January 20, M. S. Crosby, Rhinebeck. Through State Conservation Commission. Same, gall on Norway spruce, June 16, S. G. Harris, Tarrytown. Same, June 17, C. C. Laney, Rochester. Same, July 10, P. V. D. Gott, Goshen
- C. strobilobius* Kalt., woolly larch aphid, adults and eggs on larch, June 23, Mrs M. S. Miller, Boonville
- C. floccus* Patch, galls on spruce, August 23, John Nill, Star Lake
- Tetraneura ulmisacculi* Patch, English elm pouch gall, galls on *Ulmus campestris*, June 5, Frost & Bartlett Company, Stamford, Conn.
- Pemphigus ulmifusus* Walsh, slippery elm gall, gall on elm, June 24, Charles Goodyear, Tarrytown. Same, August 23, Frost & Bartlett Company, Stamford, Conn.
- P. tessellata* Fitch, alder blight, adults on soft maple, July 5, Townsend Cox jr, Setauket
- Schizoneura lanigera* Hausm., woolly apple aphid on apple, November 5, Richard Harrer, New York City. Same, adults on apple, June 28, G. M. Patten, Poughkeepsie. Same, young on apple, September 5, J. A. Seely, Ogdensburg
- Longistigma caryae* Harr., hickory aphid, adults, June 4, J. F. Rose, South Byron
- Aphis maidis* Fitch, corn leaf aphid on corn, November 2, Roy Latham, Orient Point
- ? *Nectarophora solanifolii* Ashm., potato plant louse on potato, September 27, C. S. Conkling, Gouverneur
- Mindarus abietinus* Koch., balsam aphid, work on balsam, June 9, Lake Clear. Through State Conservation Commission. Same, adults and work on balsam, June 21, S. S. Terry, Elizabethtown. Same, June 14, John Nill, Star Lake. Through State Conservation Commission
- Gossyparia spuria* Mod., elm bark louse, females on elm, June 13, C. C. Woolworth, Castleton. Same, adults on elm, June 18, Miss N. Neilson, Nyack
- Phenacoccus acericola* King, false maple scale on hard maple, October 18, A. M. Voorhis, Nyack. Same, November 5, Richard Harrer, New York City. Same, adults on bark, February 17, M. J. Naramore, Ossining. Same, adults on maple, June 28, G. M. Patten, Poughkeepsie. Same, females and young on sugar maple, September 26, J. James de Vyver, Bronxville
- Pulvinaria acericola* Walsh, adults on *Cornus*, June 13 and 24, Charles Goodyear, Tarrytown
- P. vitis* Linn., cottony maple scale, adults and eggs on soft maple, June 14, Charles R. Towson, New York City. Through State Conservation Commission. Same, June 18, E. L. George, New York City. Same, July 14, Carleton Macey, Hewlett. Same, adult on sugar maple, July 15, M. J. Devers, Hoosick Falls
- Toumeyella liriodendri* Gml., tulip tree scale, adults and young on tulip, February 1 and 5, J. H. Livingston, Tivoli. Same, August 15, Mrs T. W. Powell, Flushing, L. I. Same, adults and young on tulip, September 4, Charles Goodyear, Tarrytown

- Eulecanium lintneri* Ckll. & Benn., sassafras soft scale, adults and young on sassafras, July 21, Roy Latham, Orient Point
- E. rugosum* Sign., quince soft scale, adults on quince, June 3, A. E. Stene, Kingston, R. I.
- Coccus hesperidum* Linn., soft scale, adults on fern, May 29, E. H. Porter, New York City
- Physokermes piceae* Schr., spruce bud scale on spruce, January 29, P. L. Huested, Blauvelt. Same, eggs on Norway spruce, June 12, Arthur Dummett, Mount Vernon
- Chionaspis euonymi* Comst., Euonymus scale, adults on privet, probably *Ligustrum bota*, November 21, Benjamin Hammond, Hudson Heights, N. J.
- C. furfura* Fitch, scurfy scale, eggs, April 17, Theodore Haney, Ravena
- C. pinifoliae* Fitch, the pine leaf scale, adult on Austrian and white pine, November 12, J. J. Levison, Brooklyn. Same, adults on pine, July 12, S. S. Terry, New York City
- Diaspis echinocacti* Bouché, Cactus scale, adults and young on Cactus, September 30, Porto Rico. Through F. J. Seaver, New York City
- D. carueli* Targ., Juniper scale, adults on *Arbor vitae*, June 23, Leonard Barron, Garden City
- Drosicha lichenoides* Ckll., fig scale on *Ficus nata* (fig), October 22, T. D. A. Cockerell, Los Banos, P. I. Coll. C. F. Baker, 1912, cotypes
- Aonidia lauri* Bouché, Bay tree scale on Bay tree, October, T. F. Niles. Through State Department of Agriculture
- Aspidiotus perniciosus* Comst., San José scale, adults and young on rose, January 15, Albany. Through State Department of Agriculture. Same, young on elm, March 3, M. C. Albright, Coeymans. Same, adults and young on pear, July 8, T. E. Bullard, Schuylerville
- A. ostreaeformis* Curt., European oyster scale, adult on apple, May 15, H. M. Doyle, Oswego
- A. osborni* Newell & Cockerell, oak scale, adults on white oak, October, F. J. Stubing, Mount Vernon
- Lepidosaphes ulmi* Linn., oyster shell scale on poplar and maple, December 9, H. W. Gordinier, Troy
- Neurocolpus nubilus* Say, adult on sumac, July 12, L. F. Strickland, Lockport
- Paracalocoris scrupeus* Say, nymphs on grape, June 13 and July 12, L. F. Strickland, Lockport
- Lygus pratensis* Linn., tarnished plant bug, adults on *Chrysanthemum*, September 4, L. C. Griffith, Lynbrook

Plecoptera

- Pteronarcys* ? *biloba* Newm., May 8, G. G. Atwood, Albany
- P. proteus* Newm., giant stone fly, adult, June 6, Miss Eliza S. Blunt, New Russia

Thysanoptera

- Euthrips pyri* Dan., pear thrips, adults, April 25, F. M. Brooks, Athens

Thysanura

Schoturus nivicola Fitch, snow flea, adults, December 26, E. H. Rodgers,
Mount Kisco. Through State Department of Agriculture

Acarina

Eriophyes quadripes Shimer, gall on maple, May 12, Miss Louise Hunter,
Cornwall

E. abnormis Garm., gall on linden, September 30, E. Bethel, Denver, Col.

Bryobia pratensis Garm., red spider, adults and eggs on Arbor vitae, June 23,
Leonard Barron, Garden City

APPENDIX

A STUDY OF GALL MIDGES II

ITONIDIDINAE

This subfamily comprises by far the larger number of species belonging to the Itonididae and includes practically all the gall-making forms. Species belonging in this group may be recognized by the metatarsus being always shorter than the following segment and by the presence of but three or four long veins in the wings, in connection with the peculiar circumfli, auditory in function and evidently important, of the antennae. These latter structures appear to be present throughout the subfamily, though they do not occur in either the Heteropezinae or the Lestremiinae. Species of the two last named groups appear to depend mostly upon various olfactory organs.

There is great diversity in this subfamily, though its representatives possess much in common. Extreme types of development may be seen in *Didactylomyia* of the *Epidosariae*, *Clinorhyncha* of the *Lasiopterariae*, *Cincticornia* of the *Asphondyliariae*, and in a number of the genera of the *Itonididinae*. A large proportion of the species in this subfamily, aside from the *Epidosariae*, display a marked preference for living plant tissues and may be found inhabiting all portions of a plant, leaf and flower buds being favorite points of attack. Many species produce characteristic galls, while in some instances, at least, several forms may occur in the same gall.

Key to tribes

- a* A crossvein uniting the third vein and subcosta and usually parallel with costaTribe *Epidosariae*
- aa* No distinct crossvein uniting the third vein with subcosta
 - b* Antennal segments cylindric, the flagellate never binodose in the male
 - c* Claws toothed
 - d* Costa rarely thickly clothed with scales, the third vein well separated from costa; antennal segments usually stalked in the male.....Tribe *Dasyneurariae*
 - dd* Costa thickly clothed with scales, the third vein usually very close to costa; antennal segments cylindric, sessile, not producedTribe *Lasiopterariae*
 - cc* Claws simple
 - d* Antennal segments cylindric or subcylindric, not elongated, usually stalked in the male.....Tribe *Oligotrophariae*
 - dd* Antennal segments cylindric, elongate, sessile, the ovipositor usually aciculate.....Tribe *Asphondyliariae*
- bb* Flagellate antennal segments usually binodose in the male, circumfli usually greatly produced.....Tribe *Itonididinae*

DASYNEURIARIAE

The species belonging to the tribe Dasyneuriariae may be recognized by the dentate claws, the third vein well separated from costa and by the antennal segments of the male being almost invariably with a distinct stem. The palpal segments may vary in number from one to four and the antennal segments from 12 to over 20.

This group comprises a large number of Phytophagous species, the zoophagous Coccidomyias being exceptions. The two most important genera are Dasyneura and Rhabdophaga, the former being of medium size and usually brownish or yellowish. Rhabdophaga includes a number of large, usually reddish or reddish brown species which display a marked preference for woody tissues, especially the cortical layers of willow. Members of these genera occur very largely in leaf folds, leaf buds or loose, leafy bud galls.

The reared parasites, recorded on the following pages, have been kindly determined by Mr C. T. Brues of the Bussey Institution.

Key to genera

a Palpi at least quadriarticulate

b Antennae usually with 14 or more segments

c Third vein uniting with costa very near or at the wing apex, straight and usually tapering distally.....

d Ovipositor not chitinized apically, claws plainly unidentate..
Rhabdophaga Westw.¹

dd Ovipositor chitinized apically, bladelike, claws weakly toothed.....Procystiphora n. g.

cc Third vein uniting with costa distinctly before the wing apex, straight or curved anteriorly and tapering but little distally

d Wings hyaline, the membrane not scaled; female ovipositor long, sometimes longer than the body; circumfili not greatly produced.....Dasyneura Rond.²

dd Wings fuscous, the membrane scaled; female ovipositor short; circumfili in male sometimes strongly produced, much as in male of Bremia....Lasiopteryx Westw.

bb Antennae with 11-12, rarely 13-14 segments

c Basal clasp segment of the male genitalia rather stout

d Third vein nearly straight, uniting with costa near the apex, antennal segments sessile in both sexes.....
Arnoldia Kieff.

dd Third vein strongly curved, uniting with costa at the distal 4th, antennal segments of the male stemmed.....

Neuromyia Felt.

¹ Riveraella Kieff., Trichoperrisia Kieff., Xyloperrisia Kieff. and Pernettyella Kieff. appear to be closely related.

² We are unable at present to separate satisfactorily Microperrisia Kieff. from all members of this large series.

- cc* Basal clasp segment of the male genitalia very stout.....
Macrolabis Kieff.
- aa* Palpi triarticulate
b Antennae with 15-20 segments, genitalia of male normal.....
Dryomyia Kieff.¹
- bb* Antennae with 13-14 segments, the terminal clasp segment of the male genitalia short, swollen, the ovipositor moderate, stout with a slender apical spine.....*Cystiphora* Kieff.²
- bbb* Antennae with 12 segments, the terminal clasp segment of the male genitalia long, slender, the ovipositor short, lobed.....
Rhizomyia Kieff.³
- aaa* Palpi biarticulate
b Antennae with 12 segments.....*Coccidomyia* Felt.
- bb* Antennae with 18 segments.....*Diarthronomyia* Felt
- aaaa* Palpi uniarticulate
b Antennal segments 17 or 18, claws trifid.....
Guarephila Tav.⁴ (Brazilian)

RHABDOPHAGA Westw.

Dichelomyia Rübs. in part*Bertieria* Kieff.

- 1847 **Westwood, J. O.** Gardeners Chronicle, p. 588
- 1850 **Loew, H.** Dipt. Beitr., 4:20, 21 (*Cecidomyia* in part)
- 1861 **Rondani, C.** Soc. Sci. Nat. Milano Atti, 2:286 (*Cecidomyia* in part)
- 1864 **Schiner, J. R.** Fauna Austriaca Fliegen, 2:369 (*Cecidomyia* in part)
- 1876 **Bergenstamm, J. E. & Low, Paul.** Syn. Cecidomyidarum, p. 24
- 1892 **Rubsaamen, E. H.** Berl. Ent. Zeitschr., 37:346 (*Dichelomyia* in part)
- 1892 **Theobald, F. V.** Acct. Brit. Flies, p. 50 (*Cecidomyia* in part)
- 1896 **Kieffer, J. J.** Soc. Ent. Fr. Bul., p. 188-89 (*Bertieria*)
- 1897 ——— Syn. Cecid. de Eur. & Alg., p. 5 (*Bertieria*)
- 1900 ——— Soc. Ent. Fr. Ann., 69:444
- 1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 351
- 1909 ——— Ent. Soc. Ont. 39th Rep't, p. 45
- 1910 **Rubsaamen, E. H.** Zeitsch. Wissenschaft. Insektenbiol., 15:337
- 1911 **Felt, E. P.** N. Y. Ent. Soc. Jour., 19:43

This genus comprises a number of large, usually reddish brown forms breeding mostly in woody galls, particularly those on willow. It intergrades with *Dasyneura* and the more typical members may be distinguished by the usually tapering third vein uniting with the

¹ *Calopedila* Kieff. and *Spartomyia* Kieff. are related forms.

² *Geocrypta* Kieff. is allied to this genus.

³ *Ctenodactylomyia* Felt, MS may be separated from *Rhizomyia* by the larger number of antennal segments and especially by the pectinate claws.

⁴ *Scheuria* Kieff. is recognizable by the unidentate claws and reticulate circumfili.

margin at or very near the apex of the wing. The type is *Cecidomyia viminalis* Westw. a species Kieffer considers identical with *R. salicis* Shrnk.

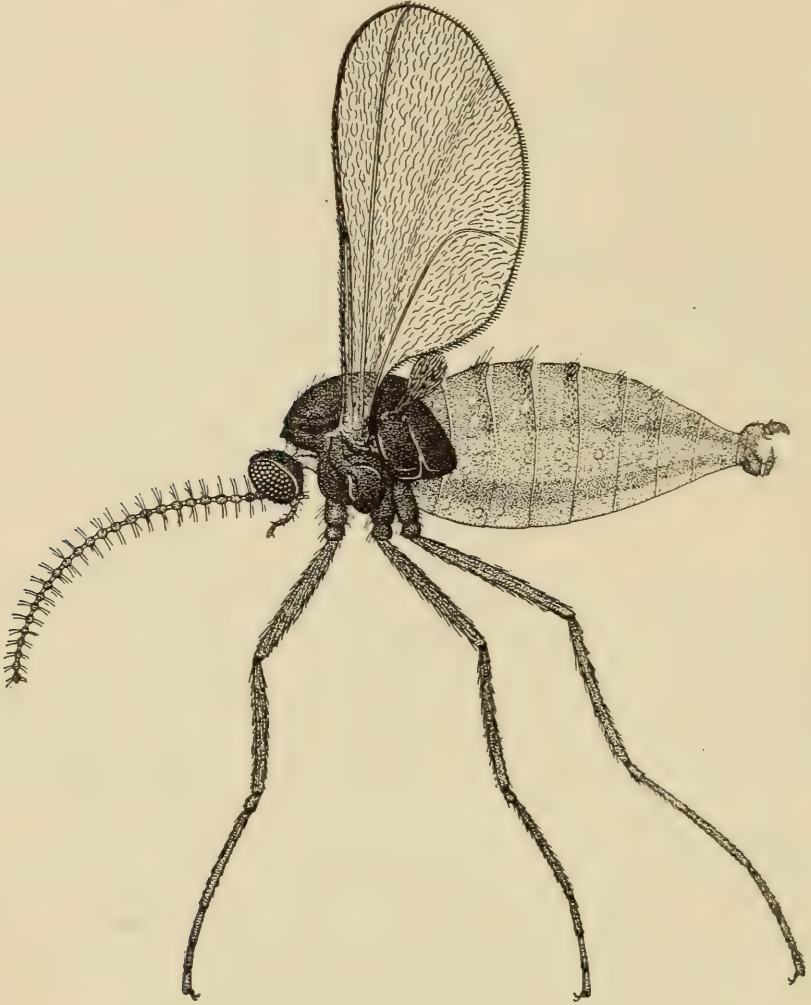


Fig. 14 *Rhabdophaga* species, showing the general characteristics of the genus (enlarged, original)

Key to species

a 14 antennal segments

b Segments sessile; abdomen reddish brown; claws rather stout.
 Reared apparently from a *Rigidæ* gall.....
sodalitatis Felt, 11074b

aa 15 to 17 antennal segments

b Females; antennae short, segments sessile

c Third vein uniting with the costa at the apex; the ovipositor shorter than the body

- d* 17 antennal segments, the fifth with a length twice its diameter; the fourth palpal segment one-quarter longer than the third; the lobes of the ovipositor with a length three times the width. Reared from *Triticoides* and *Hordeoides* galls of Walsh.....
triticoides Walsh, a1087x, a1073x, a1101, a1076
- dd* 16 antennal segments
- e* Fifth antennal segment with a length twice its diameter, tapering distally; the fourth palpal segment with a length one-half greater than the third; the lobes of the ovipositor with a length three and one-half times their width. Reared from an apparently typical *Strobiloides* gall..*persimilis* Felt, a1811a
- ee* Fifth antennal segment with a length three times its diameter; fourth palpal segment a little longer than the third; lobes of the ovipositor broadly oval, with a length about one-quarter greater than the width. Reared from *Elymus americanus*.....
elymi Felt, C. 1044
- ddd* 15 antennal segments
- e* Fifth antennal segment with a length one-half greater than its diameter; ovipositor lobe with a length one-quarter greater than its width; abdomen dark red, yellowish basally. Reared from nodular gall at base of willow twigs.....*nodula* Walsh, a1412
- ee* Fifth antennal segment with a length two and one-half times its diameter; ovipositor lobe with a length three times its width; the third and fourth palpal segments equal. Reared from willow twig.....
ramuscula Felt, a1449a ? C. 1242
- cc* Third vein uniting with the costa a little before the apex; ovipositor long
- d* 15 antennal segments
- e* Fifth antennal segment with a length one-half greater than its diameter
- f* Fifteenth antennal segment slightly extended, with a length only three times its diameter, the fourth palpal segment one-half longer than the third. Reared from rolled willow leaves.....
plicata Felt, C. 1037
- ee* Fifth antennal segment with a length twice its diameter
- f* Fifteenth antennal segment reduced, partly fused with the fourteenth; fourth palpal segment twice the length of the third; reared from crumpled soft maple leaf.....*rileyana* Felt, C. 1041
- ff* Fifteenth antennal segment normal, with a length three times its diameter; fourth palpal segment with a length one-half greater than the third; reared from maple leaves..*aceris* Shimer a2344

- fff* Fifteenth antennal segment extended, with a length fully five times its diameter; third and fourth palpal segments equal; ovipositor lobe with a length four times its diameter. Reared from small, clustered, rosette bud galls on willow.....
r a c e m i Felt, C. 1245
- dd* 17 antennal segments
- e* Wings broad; fifth antennal segment with a length one-half greater than its diameter; fourth palpal segment with a length twice that of the third; ovipositor lobe with a length two and one-half times its diameter....
m a r g i n a t a Felt, C. 81
- ee* Wings narrow; fifth antennal segment with a length twice its diameter; the fourth palpal segment one-quarter longer than the third; ovipositor lobe with a length three times its width. Reared from irregular twig gall on willow.....*s a l i c i s* Schrank, 18356
- bb* Males; antennal segments stemmed
- c* Stem of fifth antennal segment with a length one-quarter that of the basal enlargement. Reared from rose.....
r o s a c e a Felt, C. 1244
- cc* Stem of fifth antennal segments with a length one-half that of the basal enlargement
- d* Antennae slender, the basal enlargement of the fifth segment with a length twice its diameter; the palpi slender, the fourth one-quarter longer than the third; harpes with a long chitinous process apically. Reared from willow twig.....*r a m u s c u l a* Felt, 1449a
- dd* Antennae stout, the basal enlargement of the fifth segment with a length one-half greater than its diameter; the third and fourth palpal segments equal; harpes without long chitinous processes apically. Reared from a nodular gall at the base of willow twig...*n o d u l a* Walsh, 1412, C. 779
- ccc* Stem of fifth antennal segment with a length three-quarters that of the basal enlargement
- d* Antennae nearly as long as the body
- e* The basal enlargement of the fifth antennal segment with a length twice that of its diameter
- f* Wings broad with a length only about one-half greater than the width
- g* 17 antennal segments, the fourth palpal segment one-half longer than the third. Reared from apparently normal willow buds.....
l a t e b r o s a Felt, C. 1958
- ff* Wings slender, with a length about two and one-half times their width
- g* Claws strongly curved, the basal tooth long
- h* 17 antennal segments, the basal enlargement of the fifth with a length two and one-half times its diameter; the fourth palpal

- segment one-quarter longer than the third.
 Reared from irregular stem gall on
 willow.....*salicis* Schrank, a1356
- gg* Claws long, slightly curved, the basal tooth
 small
- h* 17 antennal segments, the basal enlargement
 of the fifth ovate, with a length twice its
 diameter..*californica* Felt, C. 1012
- hh* 18 antennal segments, the fifth having the
 basal enlargement cylindric, with a length
 two and one-half times its diameter.....
occidentalis Felt, C. 1073
- ee* Basal enlargement of the fifth antennal segment with
 a length only one-half greater than its diameter
- f* 16 antennal segments; reared from a *Triticoides* and
Hordeoides gall of Walsh.....
triticoides Walsh, a1076, a1087c, a1093
- dd* Antennae about two-thirds the length of the body
- e* Subcosta uniting with the margin just before the basal
 half
- f* 15 antennal segments, the fifth having the basal en-
 largement with a length one-half greater than its
 diameter, the fourth palpal segment one-half
 longer than the third; reared from maple leaves
aceris Shimer, a2344
- ff* 16 antennal segments, the fifth having the basal en-
 largement with a length twice its diameter; the
 fourth palpal segment twice the length of the
 third.....*pratensis* Felt, C. 141
- fff* 16 antennal segments, the fifth having the basal en-
 largement one-half longer than its diameter; the
 third and fourth palpal segments equal; reared
 from small clustered rosette bud galls on willow
racemi Felt, C. 1245
- ee* Subcosta uniting with the margin at the basal third
- f* Fifth antennal segment having the basal enlargement
 with a length one-half greater than its di-
 ameter
- g* 15 antennal segments; the ventral plate slender,
 deeply emarginate, the lobes short; *harpes*
subacuta.....*acerifolia* Felt, C. 36
- ff* Fifth antennal segment having the basal enlarge-
 ment with a length twice its diameter
- g* 15 antennal segments; *harpes* obliquely truncate
 with conspicuous quadrate teeth; reared from
 a subglobular polythalamous gall on side of
 willow twig.....*globosa* Felt, a1084
- gg* 17 antennal segments; *harpes* subacuta with
 variable quadrate teeth; reared from a *Triti-*
coides and *Hordeoides* gall of Walsh.....
triticoides Walsh, a1076, a1087, a1093

- cccc Fifth antennal segment with a stem one-quarter longer than the basal enlargement
- d 16 antennal segments; the dorsal plate triangularly incised; ventral plate deeply and narrowly incised; reared from a deformed willow bud.....gemmae Felt, C. 254
- cccc Fifth antennal segment with a stem three times the length of the basal enlargement.....porrecta n. sp., C. 1301
- aaa 18 to 20 antennal segments
- b Females, antennal segments sessile
- c 18 antennal segments
- d Antennal segments tapering distally
- e Length 2.5 mm; abdomen dark brown; the fifth antennal segment with a length one-half greater than its diameter; thinly setulose; the fourth palpal segment one-half longer than the third; reared from whitish cocoons on poplar..populi Felt, C. 78x, a322, a1126
- ee Length 3 mm; abdomen dark brown; the fifth antennal segment with a length twice its diameter; thickly setulose; fourth palpal segment one-quarter longer than the third; reared from a small, oval, rosette gall on willow.....normaniana Felt, C. 1246
- eee Length 3.5 mm; abdomen reddish brown; the fifth antennal segment with a length two and one-half times its diameter; fourth palpal segment a little longer than the third; reared from slender willow twigs....caulicola Felt, C. a1822
- eeee Length 1.5 mm; abdomen reddish brown; the fifth antennal segment with a length twice its diameter; thickly setulose; the fourth palpal segment one-quarter longer than the third; reared from twigs on Cephalanthus.....cephalanthi Felt, C. 1048
- cc 19 or 20 antennal segments
- d Abdomen dark brown; the fifth antennal segment with a length one-half greater than its diameter; the third and fourth palpal segments equal; reared from a gouty twig gall on willow.....batatas Walsh, a686, a1102, a1108
- dd Abdomen reddish brown; the fifth antennal segment with a length twice its diameter; the fourth palpal segment one-quarter longer than the third; reared from a fleshy pouch gall on Spiraea leaf.....salicifolia Felt, C. 1045, a1505
- bb Males, antennal segments stemmed
- c Stem of the fifth antennal segment one-third the length of the basal enlargement
- d 19 antennal segments; length 3 mm; dorsal plate very deeply incised, almost divided; the harpes truncate.....consobrina Felt, C. 39
- dd 18 antennal segments; length 2 mm; dorsal plate very deeply emarginate; harpes subtriangular; reared from whitish cocoon on poplar.....populi Felt, C. 78x, a322, a1126

cc Stem of the fifth antennal segment one-half the length of the basal enlargement

d Length 2.5 mm; harpes rounded distally.....
absobrina Felt, C. 40

ccc Stem of the fifth antennal segment with a length three-quarters that of the basal enlargement

d Length 2.5 mm; ventral plate long, narrowly and deeply incised; reared from gouty gall on willow twig.....
batatas Walsh, a686, a1102, a1108

dd Length 2 mm; ventral plate long, deeply and roundly emarginate; reared from slender willow twigs.....
caulicola Felt, C. a1822

ddd Length 2 mm; ventral plate broad, deeply and roundly emarginate; reared in jar containing *Schizomyia pomum* galls on grape.....
hirticornis Felt, a1940, a1941

cccc Stem of the fifth antennal segment as long as the basal enlargement

d Length 1.5 mm; ventral plate long and broadly rounded distally; reared from pouch fold gall on *Spiraea* leaf....
salicifolia Felt, a1505

aaaa 21 or more antennal segments

b Females, segments sessile or subsessile

c Length 4 mm; 22 to 23 antennal segments, the fifth with a length twice its diameter; abdomen dark reddish brown; reared from inconspicuous swellings on willow twigs.....
podagrae Felt, a1399, a1076y¹

cc Length 5 mm; 26-29 antennal segments. Reared from clustered rosette gall on dwarf willow.....
rhodoides Walsh, C. 1247, 775-77

ccc 25 to 26 antennal segments; lateral whitish tufts on abdomen usually well marked; lobes of ovipositor oval with a length twice their breadth; reared from pine cone gall on willow....
strobiloides Walsh

cccc 24 antennal segments; the lateral tufts on abdomen not well marked; lobes of ovipositor long, narrowly oval, with a length two and one-half times the width; reared from leafy rosette gall on willow.....*brassicoides* Walsh

bb Males, antennal segments stemmed

c Stem of the fifth antennal segment with a length three-quarters that of the basal enlargement, males

d 23 antennal segments; the fourth palpal segment one-half longer than the third; apical processes on harpes short, broadly rounded; length 4 mm; lateral tufts on abdomen well marked; reared from pine cone gall on willow.....
strobiloides Walsh, a1173, a1340, a1442, C. 1248

¹ We have placed *Rhabdophaga cornuta* Walsh here provisionally owing to the similarity of the galls.

- dd* 22 antennal segments; fourth palpal segment as long as the third; the apical chitinous processes on the harpes long, subquadrate; length 3.5 mm; lateral tufts on abdomen not well marked; reared from leafy rosette gall on willow.....*brassicoides* Walsh, a1433, a1467
- ddd* 23 to 25 antennal segments; harpes broadly truncate; length 4 mm; reared from large loose apical leaf gall on willow
? *rhodoides* Walsh, C. 775-77, 1247
- dddd* 21 to 23 antennal segments; length 3 mm; reared from slightly swollen willow twigs.....
podagrae Felt, a1399, a1076y

Rhabdophaga sodalitatis Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 351

The reddish brown female described below was reared at Albany, N. Y. April 13, 1906, from what appeared to be a typical *Phytophaga rigida* gall on willow, *Salix*.

Female. Length 3 mm. Antennae extending to the second abdominal segment, sparsely haired, dark brown; 14 segments, the fifth with a length two and one-half times its diameter; terminal segment produced, with a length four times its diameter, subacute apically. Palpi; first segment long, expanded distally, the second as long as the first, rectangular, the third a little longer than the second, more slender, the fourth one-fourth longer than the third, slender. Mesonotum dark brown. Scutellum reddish brown. Abdomen dark brown. Wings hyaline, costa dark red, subcosta uniting therewith at the basal third. Halteres yellowish brown. Legs brownish yellow, the tarsi darker; claws slender, strongly curved, the pulvilli as long as the claws. Ovipositor nearly as long as the abdomen, the terminal lobes with a length nearly five times the width, tapering, narrowly rounded. Type *Cecid.* a1074b.

Rhabdophaga triticoides Walsh

1864 **Walsh, B. D.** Ent. Soc. Phila. Proc., 3:598 (*Cecidomyia*); p. 599 (*C. hordeoides*)

1867 ——— Ent. Soc. Phila. Proc., 6:225 (*Cecidomyia*)

1906 **Felt, E. P.** Ins. Affect. Prk. & Wldd. Trees, N. Y. State Mus. Mem. 8, 2:745 (*Cecidomyia* and *C. hordeoides*)

1908 ——— N. Y. State Mus. Bul. 124, p. 351, 353

1908 **Jarvis, T. D.** Ent. Soc. Ont. 38th Rep't, p. 87-88

1909 ——— Ent. Soc. Ont. 39th Rep't, p. 92

1912 **Cosens, A.** Canad. Inst. Trans., 9:322-23 (*Cecidomyia*)

The gall of this species was recorded by Walsh as being very rare on *Salix cordata* near Rock Island, Ill. What we take to be a modified form of this gall was also described under the name of *C. hordeoides*. This gall is rather common in

the vicinity of Albany, N. Y., has been taken by Miss Cora H. Clarke at Magnolia, Mass., is listed from Ontario, Canada, by Jarvis and is presumably widely distributed.

In early August the yellowish larvae may be found in cylindric, brown, hard cells 4 to 5 mm long and 1.5 mm in diameter. These cells are evidently in or near the center of a leaf bud and are surrounded by softer, green tissue from which they may frequently be drawn in part at least. The infestation by this midge results in dwarfing the buds and surrounding tissues, thus producing the characteristic "wheat-ear" deformity. The developing gall may be readily detected by the thick cluster of small leaves. The insect winters in the gall, the midges appearing in early spring. Several parasites have been reared from this deformity, *Eupelmus dryorhizoxeni* Ashm., *Platygaster obscuripennis* Ashm., *Polynema striaticornis* Girault and species of *Polygnotus* and *Torymus*.

Gall. The gall of this species is an irregular enlargement 1 to nearly 3 cm long and about 6 mm in diameter. It is evidently caused by the dwarfing of a number of adjacent buds and presents a remote resemblance to a head of wheat. See plates 13, 14.

Larva. Length 2 mm, stout, whitish or yellowish white; breast-bone bidentate, the shaft obscure.

Male. Length 2 mm. Antennae two-thirds the length of the body, light brown; 17 segments, the fifth with a stem about $\frac{2}{3}$ the length of the enlargement. Palpi; the first segment short, stout, second broader, almost oval, the third more slender, the fourth one-fourth longer. Head dark brown. Mesonotum dark brown, sublateral lines ornamented with yellowish white hairs. Scutellum, postscutellum and abdomen dark brown, the latter rather thickly clothed with yellowish hairs and with silvery reflections laterally. Wings hyaline, tinged with reddish about the base; costa dark brown; halteres yellowish transparent at base, fuscous apically. Legs light brown, silvery ventrally, tarsi darker; claws slender. Genitalia; basal clasp segment stout, terminal clasp segment broad at base. Dorsal plate broad, deeply emarginate; ventral plate broad, broadly emarginate. Harpes stout, with a stout, quadrate and a subconical tooth distally.

Female. Length 2.5 mm. Antennae about one-half the length of the body, light brown; 17 segments, the fifth nearly cylindric, sessile. Palpi; first segment slightly elongate, expanded distally, second suboval, third slightly fusiform and a little longer, fourth more slender and one-fourth longer. Head dark brown. Mesonotum dark brown, submedian lines ornamented with yellowish white hairs. Scutellum reddish brown, postscutellum lighter. Ovipositor long, acutely rounded. Cecid. 11101.

Rhabdophaga persimilis Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 351

This moderate sized, reddish or dark brown species was apparently reared at Albany, N. Y., April 11, 1908 from a rather typical though slender *R. strobiloides* Walsh gall. It is possible that this species came from an unrecognized twig gall. *Polygnotus* species was also obtained.

Female. Length 3 mm. Antennae extending to the second abdominal segment, reddish brown; 16 sessile segments, the fifth tapering distally, with a length fully twice its diameter; terminal segment produced, evidently composed of two closely fused, subacute. Palpi; first segment short, stout, the second stout, with a length three times its width, the third a little longer, more slender, the fourth one-half longer than the third. Mesonotum dark brown, the submedian lines indistinct. Scutellum and postscutellum reddish brown. Abdomen dark brown. Wings hyaline, costa dark brown. Halteres probably yellowish brown. Legs dark brown, the tarsi almost black; claws stout, strongly curved, the pulvilli as long as the claws. Ovipositor about one-half the length of the abdomen, the terminal lobes with a length three times the width, narrowly rounded. Type Cecid. a1811a.

Rhabdophaga elymi Felt

1909 **Felt, E. P.** Econ. Ent. Jour., 2:289

This reddish brown female was reared January 19, 1891 from *Elymus americanus* collected at Alameda, Cal.

Female. Length 2 mm. Antennae extending to the second abdominal segment, light brown; 16 segments, the fifth with a length at least three times its diameter; terminal segment produced, with a length two and one-half times its diameter and occasionally partially fused with the preceding. Palpi; first segment short, stout, the second narrowly oval, the third one-half longer than the second, slender, the fourth a little longer and more slender than the third. Mesonotum dark brown, the submedian lines fuscous yellowish. Scutellum reddish brown, postscutellum fuscous yellowish. Abdomen light reddish brown. Wings hyaline, costa pale straw. Halteres pale yellowish basally, reddish brown apically. Legs mostly a dull yellowish brown; claws slender, evenly curved, the basal tooth slender, pulvilli longer than the claws. Ovipositor stout, about one-quarter the length of the abdomen, the lobes broadly oval. Type Cecid. 1044.

Rhabdophaga nodula Walsh

1864 **Walsh, B. D.** Ent. Soc. Phil. Proc., 3:599 (Cecidomyia)

1906 **Felt, E. P.** Ins. Affect. Prk. & Wldd. Trees, N. Y. State Mus.

Mem. 8, 2:745

1908 ——— N. Y. State Mus. Bul. 124, p. 351, 352

1908 **Jarvis, T. D.** Ent. Soc. Ont. 38th Rep't, p. 87

1909 ——— Ent. Soc. Ont. 39th Rep't, p. 92

This gall was recorded by Walsh as being rare on *Salix longifolia* near Rock Island, Ill. It is somewhat common in the vicinity of New York City, though it does not appear to be abundant around Albany. The insects winter in the gall, appearing in early spring. A circular gallery is first excavated nearly to the surface, leaving only a thin piece of bark attached by a few fibers here and there, which is readily pushed aside by the pupa as it emerges, the empty exuvium being left partly extruded. *Platygaster obscuripennis* Ashm. and *Polygnotus* species have been reared from this gall.

Gall. The gall of this species is a small, nodular swelling, usually encircling the base of the smaller branches. See plate 8, figure 1 and plate 12.

Male. Length 2.5 mm. Antennae extending to the fourth abdominal segment, fuscous brown; 16 segments, the fifth with a stem three-fourths the length of the subcylindric basal enlargement, which latter tapers slightly at each extremity; terminal segment prolonged, narrowly oval, irregularly rounded apically. Palpi; the first segment long, slightly swollen distally, the second shorter than the first, stout, irregularly subquadrate, the third a little longer than the second, more slender, slightly swollen distally, the fourth as long as the third, flattened, broader; face and mouth parts fuscous. Mesonotum dark brown, submedian lines thickly clothed with rather long, fuscous setae. Scutellum dark brown with numerous apical setae, postscutellum orange. Abdomen dark brown, the segments rather thickly margined posteriorly with long, fuscous hairs; genitalia dark brown. Wings hyaline, costa with the basal half black, the distal portion reddish. Halteres yellowish basally, fuscous apically. Legs a nearly uniform dark brown; claws long, slender, slightly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment short, stout; terminal clasp segment stout at base, obtuse; dorsal plate broad, long, deeply and triangularly incised; ventral plate broad, deeply and triangularly incised. Harpes broad, tapering, broadly rounded or subtruncate.

Female. Length 3.5 mm. Antennae extending to the second abdominal segment, sparsely haired, dusky yellowish, apical segments reddish; 15 segments, subsessile, tapering; the fifth with a

length fully twice the diameter; face fuscous. Mesonotum reddish brown, the submedian lines distinct, rather thickly clothed with fuscous setae. Scutellum dark red, with a few apical setae, post-scutellum and basal abdominal segment yellowish, the other abdominal segments dark red with a yellowish cast apically, each margined posteriorly with a rather thick conspicuous row of black setae; ovipositor orange. Wings, costa dark brown. Halteres fuscous yellowish basally, fuscous apically. Claws shorter than the pulvilli. Ovipositor probably one-half the length of the body, the terminal lobe short, broad, with a length about one-half greater than its diameter. Cecid. a1412.

***Rhabdophaga ramuscula* Felt**

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 351

This species was reared April 22, 1907 from a willow, *Salix* twig gall having every appearance of that of *R. batatas* taken on Staten Island.

Gall. Apparently identical in appearance with that of *Rhabdophaga batatas* Walsh.

Male. Length 1.75 mm. Antennae nearly as long as the body, dark brown; 16 or 17 segments, the fifth with a stem about three-fourths the length of the subcylindric basal enlargement; terminal segment narrowly oval. Palpi; first segment short, subrectangular, slightly swollen distally, the second a little longer, rounded at the extremities, the third as long as the second, more slender, the fourth one-half longer and slightly stouter than the third. Mesonotum dark brown, submedian lines rather thickly clothed with fine, yellowish hairs. Scutellum reddish brown, with a few long, yellowish setae apically, postscutellum dark brown. Abdomen dark brown, the segments posteriorly sparsely clothed with fine hairs, the genitalia and venter rather thickly so. Wings hyaline, costa dark brown. Halteres pale orange basally, fuscous apically. Legs reddish brown, the tarsi darker; claws long, slender, strongly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment enlarged basally; dorsal plate broad, broadly and triangularly emarginate; ventral plate long, deeply and triangularly incised. Harpes short, stout, distally two or three long, diverging processes, each with a length two or three times its diameter.

Female. Length 2mm. Antennae about two-thirds the length of the body, dark brown; 16 segments, the fifth subsessile, cylindric; with a length nearly twice the diameter; terminal segment slightly prolonged, acute distally. Ovipositor nearly one-half the length of the abdomen, terminal lobes long, broad, broadly rounded. Otherwise as in the male. Type Cecid. a1449a.

Rhabdophaga plicata Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 352

This species was reared from closely rolled leaves of willow May 21, 1886, presumably by Mr Pergande. The same National Museum note refers also to *Lupinus arborea* and there is a bare possibility that the two plants may have been confused.

Gall. The gall from which this insect was bred appears like several closely rolled terminal leaves.

Female. Length 1 mm. Antennae probably extending to the second abdominal segment, sparsely haired, dark brown; 15 segments, the fifth with a length one-half greater than its diameter, the terminal segment produced, with a length about three times its diameter. Palpi; first segment rather long, subquadrate, the second broadly oval, the third more slender, one-half longer, the fourth one-half longer than the third. Mesonotum dark brown, the submedian lines thickly haired. Scutellum yellowish brown, post-scutellum darker. Abdomen reddish brown, sparsely haired. Wings hyaline, costa reddish brown. Halteres yellowish transparent. Legs a variable reddish brown, tarsi slightly darker; claws very strongly curved, the pulvilli about as long as the claws. Ovipositor about one-half the length of the abdomen, the terminal lobes long, slender, narrowly rounded. Type Cecid. 1037.

Rhabdophaga aceris Shim.

1868 **Shimer, Henry.** Amer. Ent. Soc. Trans., 1:281-83 (Cecidomyia)

1905 **Washburn, F. L.** Minn. Agric. Exp't Sta. Bul. 93, p. 65 (Cecidomyia)

1906 **Felt, E. P.** N. Y. State Mus. Mem. 8, 2:728 (Cecidomyia)

1911 ——— Econ. Ent. Jour., 4:452 (Cecidomyia)

1912 ——— N. Y. Ent. Soc. Jour., 20:239-40

The midge was reared by Doctor Shimer in midsummer from pale or whitish larvae on the surface of white or silver maple leaves, *Acer saccharinum*. Doctor Shimer states that this species produces whitish cocoons upon the leaves, the midges emerging therefrom a week or two later. We have referred midges (a2344) reared by J. S. Houser of the Agricultural Experiment Station, Wooster, Ohio, August 9 and 26, 1912 to this species, and, in order to establish its identity more fully, published descriptions of both sexes. This form is closely related to *R. rileyana* Felt, the later being most easily distinguished by the long fourth palpal segment, it having a length twice that of the third. A study of a large series may show *R. rileyana* to be only a variety of Shimer's species.

Rhabdophaga rileyana Felt

1909 **Felt, E. P.** Econ. Ent. Jour., 2:289

This species was reared by C. V. Riley June 15 and July 3, 1877 from a crumpled soft maple leaf having a portion badly folded, the folds being very irregular, thickened and somewhat shriveled.

Female. Length 1.25 mm. Antennae extending to the base of the abdomen, sparsely haired, dark brown; 15 segments, the fifth with a length twice its diameter, terminal segment slightly reduced, tapering from the distal fourth and slightly fused with the preceding. Palpi; first segment short, stout, subquadrate, the second narrowly oval, the third a little longer, more slender, the fourth twice the length of the third, slender. Mesonotum shining dark brown. Scutellum and postscutellum fuscous yellowish. Abdomen yellowish brown; ovipositor yellowish. Wings hyaline, costa light brown. Halteres yellowish transparent. Legs yellowish brown, the tarsi somewhat darker; claws long, slightly curved, the pulvilli as long as the claws. Ovipositor about one-half the length of the abdomen. Type Cecid. 1041.

Rhabdophaga racemi Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 352, 353

This reddish brown species was reared May 11, 1906 by Mr Norman Criddle of Aweme, Manitoba, from small, clustered galls arising from adjacent willow buds.

Gall. This is a small, clustered, rosette deformity arising from the closely set buds, the tip of the twig apparently becoming stunted on account of the infestation. The individual galls are about 2 cm long, 1 cm in diameter and composed of numerous closely set, aborted leaves, the central ones somewhat longer than the others and variously curled.

Male. Length 1.5 mm. Antennae as long as the body, rather thickly haired, yellowish brown; 16 segments, the fifth with a stem three-fourths the length of the basal enlargement, which latter has a length one-half greater than its diameter; terminal segment slightly reduced, narrowly oval. Palpi; first segment short, stout, the second broadly oval, the third stout, with a length four times its width, the fourth a little longer, more slender. Mesonotum dark brown, the yellowish submedian lines sparsely haired. Scutellum fuscous yellowish, postscutellum darker. Abdomen reddish brown. Wings hyaline, costa reddish brown. Halteres yellowish transparent. Coxae and femora basally yellowish, the distal portion of femora and tibiae reddish brown, the tarsi mostly dark brown; claws strongly curved, the pulvilli longer than the claws. Genitalia; basal clasp segment stout; terminal clasp segment stout; dorsal plate broad, deeply and triangularly incised, ventral plate

long, slender, deeply and roundly emarginate. Harpes stout, irregular apically; style stout.

Female. Length 1.25 mm. Antennae extending to the third abdominal segment, thickly haired, dark brown; 15 segments, the fifth with a length one-half greater than its diameter, the terminal segment greatly produced, with a length four times its diameter, broadly rounded apically. Ovipositor about as long as the abdomen, the lobes slender, with a length four times the width, narrowly rounded. Type Cecid. 1245.

Rhabdophaga marginata Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 352

This brown female was taken on choke cherry, *Prunus virginiana*, at Albany, N. Y., May 23, 1906

Female. Length 2.5 mm. Antennae extending to the base of the abdomen, sparsely haired, dark brown; 17 segments, the fifth sub-

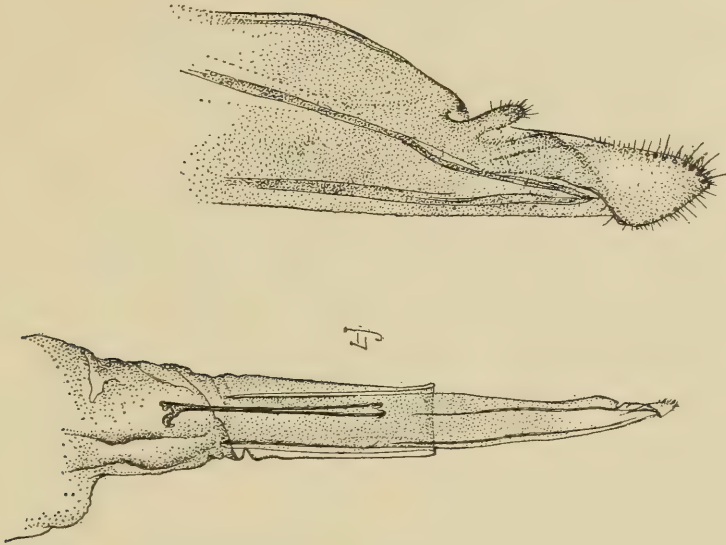


Fig. 15 *Rhabdophaga marginata*, ovipositor enlarged, the tip more enlarged (original)

sessile, subcylindric; terminal segment much prolonged, nearly twice the length of the preceding. Palpi; the first segment subquadrate, slightly swollen distally, the second one-half longer, suboval, the third one-fourth longer than the second, slender, slightly swollen distally, the fourth nearly twice the length of the third, slender. Mesonotum brown with apparently three rows of long hairs coalescing at the scutellum, which latter is covered with the same. Scutellum and postscutellum dark brown. Abdomen brown, the segments margined posteriorly with pale hairs. Wings hyaline, costa light brown. Legs pale, claws slender, strongly curved. Ovipositor nearly as long as the body; distal lobes long, slender, tapering. Type Cecid. 81.

Rhabdophaga salicis Schrk.*European willow gall midge*1803 **Schrank, F. v. P.** Fauna Boica III, 69, 2310 (Tipula)1902 **Felt, E. P.** Inj. & Other Ins. N. Y. 17th Rep't p. 741-44

1906 ——— Ins. Affect. Pk. & Wldd. Trees, N. Y. State Mus. Mem.

8, 1:299-302

1906 ——— Ins. Affect. Pk. & Wldd. Trees, N. Y. State Mus. Mem.

8, 2:620

1908 ——— N. Y. State Mus. Bul. 124, p. 353

This European gall midge has evidently become well established in this country. It was first brought to our attention in 1898 by the reception of some European willow twigs kindly sent by Mr H. C. Peck of Rochester. The insects were reared therefrom, but the species was not determined beyond question till living material was submitted, in 1902, to Prof. J. J. Kiefer, the recognized European authority upon this group. This midge was doubtless introduced with imported nursery stock. Some infested willows were probably used around bundles of imported trees. The flies escaping therefrom made their way to willows growing in the vicinity of the packing grounds. This species attracted notice in the vicinity of Rochester because of the irregular, usually fusiform enlargements on young willow canes. These abnormal growths made the willows brittle and consequently unfitted them for binding bundles of nursery stock, for which they are extensively employed by many nurserymen. This species may eventually prove a serious pest to growers of willows for basket purposes.

Life history. Adults were reared from infested galls from May 22d onward. Other specimens, received directly from the field June 3d, were disclosing flies, showing that in nature the adults issue at this time. The pupae, like those of many Itonididae, wriggle partly out of the gall before disclosing the adult, and so many may emerge from one that it presents a somewhat peculiar appearance after the flies have escaped on account of the numerous white projecting pupal cases.

The reddish, oval eggs were deposited by captive flies on the leaves in irregular clusters or groups of three to six or more. The duration of the egg stage and of the larval existence was not determined. It seems very probable that there is but one generation annually.

Rhabdophaga rosacea Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 354

The male of this species was received May 15, 1906 from Mr Norman Criddle, Awema, Manitoba. The gall of presumably the same species (C. 1268) was found September 30, 1907 by Mr L. H. Weld, on a wild rose, *Rosa*, growing on low sand dunes at Beach, Ill., near Waukegan.

Gall. An apical loose bud gall some 2 to 2.5 cm in diameter and 3 to 3.5 cm long, the component leaflets rather loose, the general appearance being somewhat similar to that of the pine cone gall on willow, plate II. There is an elongate central cell containing the pinkish larva.

Larva. Length 3 mm, stout, pale orange. Head small; antennae short, tapering; breastbone obsolescent. Skin coarsely shagreened; posterior extremity slightly lobed. Larva from Illinois specimens and tentatively referred to this species.

Male. Length 2.5 mm. Antennae extending to the third abdominal segment, yellowish brown; 16 segments, the fifth with a stem one-fourth the length of the basal enlargement, which latter has a length twice its diameter; terminal segment reduced, narrowly oval and sometimes fused with the preceding. Palpi; first segment produced, expanded distally, second with a length three times its width, the third a little longer, more slender, the fourth a little shorter than the third, dilated. Body probably reddish brown. Wings hyaline, costa dark brown. Halteres probably yellowish and fuscous. Legs presumably fuscous yellowish, the tarsal segments darker; claws rather slender, strongly curved, the pulvilli longer than the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment short, greatly swollen basally; dorsal plate deeply and triangularly emarginate; ventral plate rather short, deeply and triangularly emarginate. Harpes rather broad, truncate, dentate. Type Cecid. 1244.

Rhabdophaga latebrosa Felt

1909 **Felt, E. P.** Econ. Ent. Jour., 2:290

This species was reared at Albany, N. Y., May 7, 1909, presumably from apparently normal willow buds, though the one bud showing an exit hole did not appear as though it has been recently deserted by a fly. This species was taken at Albany, N. Y.

Male. Length 1.5 mm. Antennae as long as the body, fuscous yellowish; 17 segments, the fifth with a stem three-fourths the length of the basal enlargement, which latter has a length two and one-half times its diameter; terminal segment reduced, narrowly oval. Palpi; first segment irregular, rectangular, the second with a length three times its diameter, the third a little shorter than the second and the fourth one-half longer and more slender than

the third. Mesonotum reddish brown, the submedian lines sparsely haired. Scutellum and postscutellum dark brown, the latter orange mesially. Abdomen sparsely haired, yellowish brown; genitalia fuscous. Wings broad, hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Coxae and femora basally fuscous yellowish, the femora distally, tibiae and tarsi mostly dark brown; claws strongly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment slightly swollen basally; dorsal plate broad, deeply and triangularly emarginate; ventral plate broad, broadly and triangularly emarginate. Harpes stout, irregularly tuberculate. Type Cecid. a1958.

***Rhabdophaga californica* Felt**

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 353

The dark, reddish brown male described below was taken in Santa Clara county, California, in June. Nothing is known concerning its life history.

Male. Length 1.5 mm. Antennae about as long as the body, light brown; 17 segments, the fifth with a stem about three-fourths the length of the basal enlargement, which latter has a length about twice its diameter and tapers at both extremities; terminal segment short, stout, broadly oval. Palpi; the first segment rather slender, narrowly oval, the second a little longer, subrectangular, stouter, the third one-half longer and more slender than the second, the fourth one-half longer and much more slender than the third. Mesonotum dark brown, shining, the submedian lines sparsely haired. Scutellum light reddish brown, postscutellum a little darker. Abdomen dark reddish brown, rather sparsely haired. Wings hyaline, costa light brown. Halteres yellowish transparent. Legs a nearly uniform light reddish brown, the distal tarsal segments somewhat darker; claws long, rather slender, strongly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment short, stout; terminal clasp segment short, stout at base; dorsal plate short, deeply and triangularly incised; ventral plate long, broad, deeply and roundly emarginate. Harpes long, broad, tapering, distally a group of five or six long, slender, chitinous processes. Type Cecid. 1012.

***Rhabdophaga occidentalis* Felt**

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 353

This male was taken in Santa Clara county, California, in June.

Male. Length 2 mm. Antennae nearly as long as the body, dark brown; 18 segments, the fifth with a stem about three-fourths the length of the cylindric basal enlargement, which latter has a length three times its diameter; terminal segment greatly reduced, broadly fusiform. Palpi; first segment stout, with a length three times its diameter, the second broadly oval, a little shorter, the third one-half

longer than the second, slender, the fourth one-half longer than the third. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum dark brown, with numerous coarse setae apically, postscutellum reddish brown. Abdomen dark reddish brown; genitalia slightly lighter. Wings hyaline, costa pale straw. Halteres pale yellowish. Legs a nearly uniform light yellowish brown; claws long, slender, strongly curved, minutely unidentate, the pulvilli longer than the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment long, stout; dorsal plate long, deeply and triangularly emarginate; ventral plate long, broad, very deeply and roundly emarginate. Harpes long, narrowly rounded.

Female. Length 2.5 mm. Antennae extending to the second abdominal segment, probably brown; 17 subsessile segments, the fifth with a length three and one-half times its diameter; terminal segment greatly produced, composed of two closely fused segments, narrowly rounded apically. Ovipositor about one-half the length of the body, the terminal lobes broad, with a length one-half greater than their width, broadly rounded. Other characters nearly as in the male. Type Cecid. 1073.

***Rhabdophaga pratensis* Felt**

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 353

The dark brown male described below was taken on red clover, *Trifolium pratense*, at Albany, N. Y., June 4, 1906.

Male. Length 3 mm. Antennae probably extending beyond the base of the abdomen, dark brown; at least 12, probably 16 segments, the fifth with a stem about two-thirds the length of the subcylindric basal portion. Palpi; the first and second segments subequal, broadly oval, the third a little more prolonged, slender, the fourth over twice the length of the preceding, much more slender. Mesonotum, scutellum and postscutellum very dark brown. Abdomen dark brown. Wings hyaline, costa reddish brown. Halteres pale. Legs pale brown or reddish, tarsi a little darker; claws stout, strongly curved at the distal third. Genitalia; basal clasp segment stout; terminal clasp segment stout, obtuse; dorsal plate broad, deeply and triangularly incised; ventral plate broad, deeply and roundly emarginate. Harpes stout, subtriangular, the broadly rounded apex bearing three long, subquadrate processes. Type Cecid. 141.

***Rhabdophaga acerifolia* Felt**

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 112. Sep. p. 16

1908 ——— N. Y. State Mus. Bul. 124, p. 354

This dark brown male was taken on a hedgerow composed of maple, elm and various bushes at Albany, N. Y., May 17, 1906.

Male. Length 1.5 mm. Antennae about two-thirds the length of the body, dark brown; 15 segments, the fifth with a stem two-

thirds the length of the slightly swollen basal enlargement; terminal segment prolonged, rounded at base, obtuse apically. Palpi; the first segment short, swollen distally, the second nearly twice the length of the first, elliptical, the third a little longer, more slender than the second, and the fourth a little longer than the third. Mesonotum dark brown. Scutellum reddish brown, postscutellum dark brown and orange, basal abdominal segment dark brown, the others light brown, all sparsely clothed with whitish hairs, genitalia dark brown. Wing, pl. 5, fig. 2. Costa dark brown. Halteres yellowish transparent, somewhat fuscous apically. Legs variable brownish, tarsi darker; claws rather stout, strongly curved. Genitalia; basal clasp segment stout; terminal clasp segment broad at base, tapering; dorsal plate broad, deeply emarginate; ventral plate slender, deeply emarginate. Harpes stout, tapering, irregularly rounded, subacute. Type Cecid. 36.

***Rhabdophaga globosa* Felt**

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 354

This species was reared at Albany, N. Y., May 7, 1906 from willow, *Salix*, twigs bearing small, rounded galls, a portion of the surface showing a discolored dead area.

Male. Length 2 mm. Antennae two-thirds the length of the body, light brown; 15 segments, the fifth with a stem about two-thirds the length of the enlargement. Palpi; the first segment short, slightly swollen distally, the second and third subequal, rather slender, the fourth more slender and about one-half longer than the third. Head fuscous. Mesonotum dark brown with the sub-lateral lines marked by yellowish white hairs. Scutellum reddish brown. Abdomen dark brown, rather sparsely clothed with yellowish white hairs and with silvery white reflections laterally. Wings hyaline, costa dark brown. Halteres yellowish transparent basally, reddish brown apically. Legs dark brown, silvery ventrally; tarsi blackish. Genitalia; basal and terminal clasp segments stout; dorsal plate broad, deeply excavated; ventral plate narrow, deeply emarginate. Harpes thick, convolute, a bidentate quadrate tooth distally. Type Cecid. 21084a.

***Rhabdophaga gemmae* Felt**

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 354

This male was reared at Albany, N. Y., from a peculiar, stunted, elongate willow, *Salix*, tip in the middle of June 1906.

Gall. This appears much like a thickened bud, the scales being closely set beside each other, the deformity being approximately an inch long, with a rounded, somewhat loose tip. The cocoons were found lying between the imbricated bud scales.

Male. Length 1 mm. Antennae longer than the body, light

brown; 16 segments, the fifth with a stem one-fourth longer than the basal enlargement; terminal segment slightly prolonged, sub-oval. Palpi; the first segment subquadrate, somewhat dilated distally, the second a little stouter and longer than the first, the third one-half longer than the second, more slender, the fourth nearly twice the length of the third, more slender. Mesonotum dark brown, submedian lines sparsely ornamented with light setae. Scutellum light brown with sparse apical setae. Abdomen nearly uniform dull brown. Wings hyaline, costa dark brown; halteres whitish transparent. Legs light brown; claws stout, uniformly curved. Genitalia; basal clasp segment long, stout; terminal clasp segment stout at base. Dorsal plate broad, deeply and triangularly incised; ventral plate stout, broad, deeply and narrowly incised. Harpes stout, subtriangular.

Female. Length 1.5 mm. Antennae nearly as long as the body, light brown; 14 segments, the fifth sessile; terminal segment slightly prolonged, narrowly oval. Palpi; the first segment subquadrate, swollen distally, the second longer than the first, subrectangular, the third a little longer, more slender, the fourth longer than the third. Ovipositor nearly as long as the body, terminal lobes long, slender, narrowly rounded. Type Cecid. 254.

***Rhabdophaga porrecta* n. sp.**

This remarkable form was taken April 5, 1908 by C. P. Alexander at Gloversville, N. Y. It is anomalous in that the antennal characters are most suggestive of the *Epidosariae*, while the wing, tarsal and genitalic characters indicate strong affinities with this genus.

Male. Length 2 mm. Antennae probably three or four times the length of the body, dark brown, with at least 9 and probably 16 segments, the fifth having a stem with a length about three times that of the basal enlargement, which latter has a length twice its diameter. Palpi; first segment short, stout, narrowly oval, the second one-half longer and a little stouter, the third nearly twice the length of the preceding, the fourth one-half longer than the third, more slender. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum dark reddish brown, postscutellum dark brown. Abdomen dull reddish brown, the pleurae dark brown, genitalia fuscous yellowish. Wings narrow, hyaline, costa light brown. Halteres pale yellowish. Coxae dark brown, femora dull brown, tibiae and three basal tarsal segments fuscous yellowish, the distal tarsal segment variably tinged with reddish and reddish brown; claws long, slender, evenly curved, pulvilli as long as the claws. Genitalia; basal clasp segment stout, with a conspicuous apical lobe internally; terminal clasp segment long, stout; dorsal plate long, broad, broadly and triangularly incised; ventral plate long, broad, broadly and roundly emarginate. Harpes stout, acute apically. Type Cecid. 1301.

Rhabdophaga populi Felt

1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 112. Sep. p. 16

1908 ————— N. Y. State Mus. Bul. 124, p. 354, 355

This dark brown species was reared at Albany, N. Y., May 25, 1909 from cocoons taken at the base of poplar, *Populus tremuloides*, buds collected at Karner, N. Y. The midge winters in the cocoon, appearing in early spring. A species of *Polygnotus* was reared from this gall.

Cocoon. Oval, whitish, about 2 mm long.

Male. Length 2 mm. Antennae extending nearly to the tip of the abdomen, sooty yellowish; 18 segments, the fifth with a stem one-third the length of the basal enlargement; terminal segment reduced, suboval. Palpi; first segment broad, subrectangular, second a little more slender, longer, the third one-half longer than the second, more slender, the fourth one-fourth longer than the third, fusiform and more slender; face dark brown, narrowly margined with silvery white; mesonotum dark brown, with submedian lines of silvery white hairs and groups of the same at the base of the wing. Scutellum dark brown, postscutellum reddish brown. Abdomen dark brown, thinly clothed dorsally and thickly so laterally with silvery hairs. Wings hyaline, costa and subcosta light brown, tinged with reddish near the apex. Halteres reddish transparent at base, yellowish red apically. Legs nearly uniform brown dorsally, silvery ventrally; tarsi possibly a little darker; claws stout, uniformly curved. Genitalia; basal clasp segment stout; terminal clasp segment swollen at the basal fourth; dorsal plate broad, deeply emarginate; ventral plate broad, deeply incised. Harpes subtriangular, tapering, obtuse, with a minor chitinous lobe bearing a long, slender, obtuse tooth. See plate 5, figure 1 and plate 7, figure 2, for illustrations of the wing and genitalia respectively.

Female. Length 2.5 mm. Antennae extending to the base of the abdomen, yellowish brown; 18 segments, the fifth subsessile, the enlargement having a length one-half greater than its diameter; terminal segment reduced, subovoid. Palpi; first segment stout, subquadrate, second one-half longer, subrectangular, the third more slender and one-fourth longer than the preceding, the fourth one-half longer than the third, more slender; face yellowish brown, margined posteriorly with silvery gray hairs. Abdomen dark brown, incisures dark reddish, the segments fringed posteriorly with silvery hairs and the sides rather thickly clothed with the same. Ovipositor about one-third the length of the abdomen, the terminal lobes long, narrowly rounded. Type Cecid. a322.

Rhabdophaga normaniana Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 354

This species was reared May 17, 1906 from a small apical gall on willow, *Salix*, received from Mr Norman Criddle, Aweme, Manitoba.

Gall. A small, oval terminal bud gall resembling an aborted *Rhabdophaga brassicoides* gall.

Female. Length 3.5 mm. Antennae extending to the second abdominal segment, dark brown; 18 segments, the fifth with a length about twice its diameter; terminal segment produced, with a length two and one-half times its diameter. Palpi; first segment subtriangular, second rectangular, with a length three times its width, the third a little longer, more slender, the fourth longer and more slender than the third. Mesonotum shining black, sparsely haired. Scutellum and postscutellum shining black. Abdomen sparsely haired, dark reddish brown. Wings hyaline, costa fuscous yellowish. Halteres whitish fuscous subapically. Legs mostly fuscous yellowish, the distal tarsal segments darker; claws stout, strongly curved, the pulvilli as long as the claws. Ovipositor about half the length of the body, the lobes with a length two and one-half times the width, narrowly rounded.

Male. Length 3 mm. Antennae nearly as long as the body, dark brown; 22 segments, the fifth with a stem one-half the length of the basal enlargement, which latter has a length one-half greater than its diameter; terminal segment reduced, narrowly oval. Palpi; first segment with a length twice its diameter, the second a little longer, more slender, the third longer and more slender than the second, the fourth as long as the third, slender. Genitalia; basal clasp segment long, terminal clasp segment long, stout; dorsal plate deeply and triangularly incised; ventral plate deeply and roundly emarginate. Harpes long, stout, truncate, with a large, quadrate tooth. Type Cecid. 1246.

Rhabdophaga caulicola Felt

1909 **Felt, E. P.** Econ. Ent. Jour., 2:290

This reddish brown species was reared in April 1908 from slender willow twigs similar to those producing *Sackenomyia packardii* Felt and collected by Mr L. H. Weld at Evanston, Ill. *Eurytoma* and *Decatoma* species were reared, presumably from this midge.

Gall. This species was reared from long, slender, hardly swollen willow, *Salix*, twigs similar to those producing *Sackenomyia packardii*.

Larva. Length 3 mm, dark orange, moderately stout. Head small; antennae short; breastbone bidentate, the anterior lateral

angles greatly produced though not dentate as in *Sackenomyia*, the shaft slender, strongly chitinized. Skin coarsely shagreened; posterior extremity broadly rounded.

Male. Length 2 mm. Antennae extending to the fourth abdominal segment, dark brown; 18 or 19 segments, the fifth with a stem about three-fourths the length of the basal enlargement, which latter has a length about twice its diameter, terminal segment somewhat produced, cylindric, with a length about three times its diameter and distally tapering irregularly to a subacute apex. Palpi; the first segment irregular, stout, with a length over twice its diameter, the second a little shorter, subrectangular, the third one-half longer than the second, more slender, the fourth about as long as the third. Mesonotum dark brown, the submedian lines thickly haired. Scutellum dark brown, postscutellum fuscous yellowish. Abdomen dark reddish brown, sparsely haired; genitalia dark brown. Wings hyaline, costa yellowish, subcosta uniting with the anterior margin before the basal half. Halteres fuscous, reddish apically. Legs tinged with reddish and thickly clothed with silvery scales; claws long, slender, evenly curved, the pulvilli a little longer than the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment rather short, stout; dorsal plate long, broad, deeply and triangularly emarginate; ventral plate long, broad, deeply and roundly emarginate. Harpes long, stout, tapering, irregularly truncate, with several subquadrate chitinous spurs.

Female. Length 3.25 mm. Antennae extending to the second abdominal segment, light brown, the basal segments fuscous yellowish; 18 segments, subsessile, the fifth with a length about two and one-half times its diameter; terminal segment slightly produced, with a length over twice its diameter and tapering to an acute apex. Palpi; the first segment short, stout, subquadrate, the second with a length about two and one-half times its diameter, subrectangular, the third about as long as the second, more slender, the fourth a little longer and more slender than the third; face fuscous yellowish. Mesonotum reddish brown, the submedian lines thickly haired. Scutellum reddish orange, postscutellum orange. Abdomen reddish brown, membrane and pleurae deep orange; ovipositor fuscous yellowish. Wings hyaline, costa dark brown. Halteres light fuscous yellowish. Coxae and base of femora fuscous yellowish, the femora distally, tibiae and tarsi dark brown, the latter almost black; the pulvilli as long as the claws. Ovipositor about as long as the abdomen, the terminal lobes with a length nearly four times their width, tapering, narrowly rounded. Type *Cecid.* a1822.

Rhabdophaga cephalanthi Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 355

This yellowish brown form was reared at the division of entomology, United States Department of Agriculture, from twigs of button ball, *Cephalanthus occidentalis*, collected by Rev. J. L. Zabriskie at Nyack, N. Y., January 7, 1884.

Male. Length 1.5 mm. Antennae probably nearly as long as the body, fuscous yellowish; presumably 18 segments, the fifth with a stem about three-quarters the length of the subcylindric basal enlargement, which latter has a length fully twice its diameter. Mesonotum reddish brown. Scutellum yellowish brown, postscutellum a little darker. Abdomen a dark yellowish brown, somewhat darker basally and apically. Wings hyaline, costa fuscous yellowish. Halteres probably pale yellowish. Legs a nearly uniform yellowish straw. Genitalia; basal clasp segment long, stout; terminal clasp segment stout; dorsal plate broad, deeply and triangularly emarginate; ventral plate long, broad, deeply and roundly emarginate. Harpes long, stout, obliquely truncate, with chitinous tubercles at the external angles.

Female. Length 1.5 mm. Antennae extending to the second abdominal segment, fuscous yellowish; 18 segments, the fifth with a length twice its diameter, tapering distally; terminal segment reduced, narrowly oval. Palpi; first segment short, stout, subquadrate, the second suboval, the third one-half longer, more slender, the fourth as long as the third. Mesonotum reddish brown. Scutellum and postscutellum fuscous yellowish. Abdomen reddish brown, sparsely clothed with fuscous scales, the posterior segments thinly clothed with long, yellowish setae; ovipositor pale yellowish. Halteres yellowish basally, fuscous apically. Legs mostly dark reddish brown; claws stout, strongly curved, the basal tooth heavy, the pulvilli as long as the claws. Ovipositor two-thirds the length of the abdomen, the terminal lobes slender, with a length four times their width, narrowly rounded. Type Cecid. 1048.

Rhabdophaga batatas Walsh

Willow potato gall

- 1864 **Walsh, B. D.** Ent. Soc. Phila. Proc., 3:601-6 (Cecidomyia)
 1870 ——— Amer. Ent., 2:299, 301 (*Eurytoma studiosa* Say and *Decatoma nubilistigma*, parasites, Cecidomyia)
 1890 **Cockerell, T. D. A.** Ent., p. 279-80
 1892 **Beutenmueller, William.** Amer. Mus. Nat. Hist. Bul. 4, p. 268 (Cecidomyia)
 1896 **Marlatt, C. L.** U. S. Dep't Agric., Div. of Ent., Tech. Ser. 3, p. 22 (*Nematus fur* ? = *Amauronematus luteotergum* reared from gall)
 1900 **Smith, J. B.** List Ins. N. J., p. 620
 1904 **Beutenmueller, William.** Amer. Mus. Nat. Hist. Guide Leaflet 16, p. 29
 1906 **Felt, E. P.** Injur. & Other Ins. N. Y., 21st Rep't, p. 119-22
 1906 ——— Ins. Affect. Prk. & Wldd. Trees. N. Y. State Mus. Mem. 8, 2:745
 1908 **Jarvis, T. D.** Ent. Soc. Ont. 38th Rep't, p. 86
 1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 355
 1909 **Jarvis, T. D.** Ent. Soc. Ont. Bul. 39th Rep't, p. 92
 1912 **Cosens, A.** Canad. Inst. Trans., 9:324-25

This somewhat characteristic gall is rather common upon willow, *Salix*, twigs in the vicinity of Albany, N. Y. and in the neighborhood of New York City. Illinois specimens in the Museum of Comparative Zoology at Cambridge, Mass., are smaller than those commonly occurring in this State. Apparently the same gall has been received from Prof. T. D. A. Cockerell, Colorado. The adults winter in the gall, appearing in early spring. The wing and genitalia are illustrated on plate 5, figure 4 and plate 7, figure 3 respectively.

The gall is a very irregular, polythalamous enlargement occurring on the shoots of the low swamp willow, *Salix humilis*. It varies greatly in size and somewhat in form. See plate 9, figure 1. *Polygnotus* species was reared from this gall.

***Rhabdophaga salicifolia* Felt**

1907 **Felt, E. P.** New Species of Cecidomyiidae II, p. 12-13

1908 ——— N. Y. State Mus. Bul. 124, p. 293-94, 355

This characteristic gall is somewhat common on meadowsweet, *Spiraea salicifolia*, in the vicinity of Albany, N. Y., and is quite abundant in some sections of eastern Massachusetts. It was taken by Miss Cora H. Clarke in the vicinity of Magnolia, Mass. The midges were reared in July 1907 from galls taken near Albany, N. Y. *Torymus ostensackenii* D. T. was also reared from this gall.

Gall. This is a thickened, greenish fold of the midrib 1 to 1.5 cm long and about 6 mm in diameter, plate 4, figure 12. It is inhabited by several pale yellowish larvae.

Male. Length 1.5 mm. Antennae probably a little longer than the body, dark brown; at least 12 and probably 20 segments, the fifth with a stem about as long as the basal enlargement, which latter has a length nearly twice its diameter. Palpi; first segment short, stout, irregularly subquadrate, the second stout, rounded at the extremity, subrectangular, with a length fully twice the diameter, the third one-half longer and more slender than the second, the fourth a little longer and more slender than the third; face fuscous. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum a deep reddish brown, postscutellum dark fuscous. Abdomen dark brown, sparsely clothed with fine hairs. Wings hyaline, costa light brown. Halteres fuscous basally, fuscous yellowish apically. Legs a somewhat variable fuscous yellowish, the femora basally light yellowish; claws long, slender, strongly curved, the pulvilli a little longer than the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment short, stout; dorsal plate short, broadly and triangularly incised; ventral plate long, broad,

broadly and roundly emarginate. Harpes short, stout, scarcely tapering, irregularly truncate and with several chitinous spurs.

Female. Length 2.5 mm. Antennae extending to the fourth abdominal segment; fuscous yellowish; 20 sessile segments, the fifth with a length fully two and one-half times its diameter; terminal segment greatly produced, narrowly rounded distally. Abdomen very sparsely clothed with fine hairs, brown, the incisures and pleurae deep orange, the ovipositor pale yellowish, ventral sclerites dark brown. Ovipositor probably one-half the length of the abdomen, the terminal lobes long, narrowly oval. Type Cecid. a1505.

The following references apply with little question to the species described above. It may be noted that this gall occurs on *Spiraea salicifolia*, *S. tomentosa* and *S. betulaefolia*.

- 1867 **Osten Sacken, C. R.** Ent. Soc. Phila. Proc., 6:220
- 1907 **Jarvis, T. D.** 37th Rep't Ent. Soc. Ont., p. 68
- 1907 **Cook, M. T.** Acad. Sci. Proc., Sep. p. 8
- 1908 **Jarvis, T. D.** Ent. Soc. Ont., 38th Rep't, p. 88
- 1909 ———— Ent. Soc. Ont., 39th Rep't, p. 90
- 1910 **Stebbins, F. A.** Springf. Mus. Nat. Hist. Bul. 2, p. 35

***Rhabdophaga consobrina* Felt**

- 1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 113, Sep. p. 17
- 1908 ———— N. Y. State Mus. Bul. 124, p. 355.

This dark brown male was taken May 17, 1906 at Albany, N. Y., in the vicinity of maple, elm and various bushes.

Male. Length 3 mm. Antennae shorter than the body, dark brown; 19 segments, the fifth with a stem about one-third the length of the basal enlargement; terminal segment greatly prolonged, broadly rounded apically, slightly constricted at the distal third. Mesonotum dark brown, submedian lines rather thickly dark haired. Palpi; first segment subquadrate, the second one-half longer than the first, a little stouter, the third a little longer than the second, more slender and the fourth one-half longer than the third. Scutellum dark brown, thickly clothed with yellowish white hairs, post-scutellum reddish anteriorly, dark brown posteriorly. Abdomen dark brown, sparsely clothed with whitish hairs. Wings subhyaline, costa dark brown. Halteres yellowish transparent at base, fuscous apically. Legs dark brown, lighter ventrally; tarsi darker; claws stout, strongly curved. Genitalia; basal clasp segment stout; terminal clasp segment swollen basally; dorsal plate deeply incised; ventral plate narrow at base, dilating distally, deeply and triangularly emarginate. Harpes convolute, broadly truncate and with a subquadrate, chitinous process apically. Type Cecid. 39. See plate 5, figure 3 and plate 7, figure 4 for illustrations of the wing and genitalia respectively.

Rhabdophaga absobrina Felt

1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 113. Sep. p. 16-17

1908 ——— N. Y. State Mus. Bul. 124, p. 355

This dark brown male was taken May 17, 1906 at Albany, N. Y., in the vicinity of maple, elm and various bushes.

Male. Length 2.5 mm. Antennae extending to the base of the abdomen, dark brown; 19 segments, the fifth with a stem about one-half the length of the basal enlargement; terminal segment prolonged, broadly rounded. Palpi; first segment subquadrate, the second and third one-half longer than the first, a little more slender, the fourth one-quarter longer than the third; face dark brown. Mesonotum dark brown with distinct sublateral and submedian rows of golden yellow hairs. Scutellum and postscutellum reddish brown. Abdomen dark brown, rather thickly clothed laterally with silvery white hairs in patches. Wings hyaline, costa dark brown. Halteres yellowish transparent basally, fuscous apically. Legs a variable brown, lighter ventrally; tarsi dark brown; claws slender, strongly curved. Genitalia; basal clasp segment stout; terminal clasp segment swollen at base, obtuse; dorsal plate deeply incised, almost divided; ventral plate broad at base, deeply incised. Harpes stout, strongly chitinized internally, slightly convolute, broadly rounded and with two apposed subquadrate chitinous processes. Type Cecid. 40.

Rhabdophaga hirticornis Felt

1909 **Felt, E. P.** Econ. Ent. Jour., 2:290

This species was reared at Albany, N. Y., September 20, 1908 and April 1909 from jars containing various Cecidomyiid galls, notably those of *Caryomyia persicoides* and *Schizomyia pomum*. It is probable that the association of this insect with these two species was accidental.

Male. Length 2 mm. Antennae nearly as long as the body, 18 segments, the fifth with a stem three-quarters the length of the cylindric basal enlargement, which latter has a length one-quarter greater than its diameter; terminal segment reduced, narrowly oval. Palpi fuscous yellowish; first segment irregularly subquadrate, the second with a length five times its diameter, the third a little longer, dilated, the fourth as long as the third, slender. Mesonotum reddish brown, the submedian lines and anterior and lateral margins thickly white-haired. Scutellum and postscutellum reddish brown. Abdomen dark brown, the segments sparsely margined posteriorly with whitish hairs; pleurae yellowish white, venter pale yellowish; genitalia fuscous yellowish. Wings hyaline, costa dark brown. Halteres yellowish transparent. Coxae and femora basally yellowish, the distal portion of femora and tibiae fuscous yellowish, the tarsi mostly dark brown; claws large, slender, curved, unidentate, the pulvilli longer than the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment long, stout; dorsal plate rather

long, broad, deeply and narrowly incised; ventral plate long, deeply and broadly emarginate. Harpes rather long, broad.

Female. Length 2.25 mm. Antennae extending to the second abdominal segment, dark brown; 19 subsessile segments, the fifth cylindric, with a length one-half greater than its diameter; terminal segment somewhat produced, narrowly oval. Palpi fuscous yellowish, the first segment presumably subquadrate, the second stout, with a length about three times its diameter, the third as long as the second and the fourth a little longer than the third. Mesonotum dull black, the submedian lines and sublateral areas thickly clothed with pale yellow hairs. Scutellum reddish brown, post-scutellum darker. Abdomen dark brown, the segments sparsely margined posteriorly with yellowish hairs, incisures and pleurae deep reddish; ovipositor fuscous yellowish. Wings as in the opposite sex. Halteres pale orange basally, yellowish apically; coxae dark brown; femora and tibiae mostly fuscous yellowish, tarsi dark brown; claws and pulvilli as in the male. Ovipositor about half the length of the abdomen; terminal lobes with a length about five times their width. Type Cecd. a1941.

***Rhabdophaga podagrae* Felt**

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 355

This species produces rather long inconspicuous swellings in willow, *Salix*, twigs, the dark brown midges appearing in early spring. This gall was taken at East Schodack, N. Y. *Polygnotus* and *Eurytoma* species were reared from shoots infested with larvae of this midge and those of *Sackenomyia packardi* Felt. The same insect appears to produce a fusiform gall 4 by .6 cm on *Salix cordata*, since specimens were received from Dr A. Cosens, Toronto, Can., Sept. 2, 1913.



Fig. 16 *Rhabdophaga podagrae*, gall (natural size, original)

Gall. A uniform swelling of the twig some 5 to 7 cm in length and about 1 cm in diameter, irregularly channeled by orange larvae. See plate 8, figure 2.

Male. Length 3 mm. Antennae nearly as long as the body, dark brown; 21 segments, the fifth with a stem about three-quarters the length of the subcylindric basal enlargement, which latter has a length about one-third greater than its diameter; terminal segment reduced, broadly fusiform, obtuse apically. Palpi; first segment subrectangular, slightly swollen distally, the second one-half longer, more slender, the third one-quarter longer and more slender than the second, and the fourth a little longer than the third; face fuscous, sparsely clothed with light hairs, narrowly margined posteriorly with white. Mesonotum dark brown, sparsely bordered later-

ally with yellowish hairs, the submedian lines thickly clothed with diverging yellowish hairs. Scutellum dark brown with a few yellowish setae apically; postscutellum dark brown. Abdomen dark brown, sparsely clothed with fine hairs, the segments margined posteriorly with longer setae; venter sparsely clothed with short, yellowish setae. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Legs rather variable brown, tarsi dark brown; claws long, slender, strongly curved, the pulvilli longer than the claws. Genitalia; basal clasp segment stout; terminal clasp segment slender, tapering; dorsal plate long, broad, deeply and narrowly incised; ventral plate broad, tapering, broadly and deeply incised, the lobes long, narrow, tapering, obtuse. Harpes broad at base, tapering, obtuse, entire surface evenly covered with short, stout setae; style short, stout, broadly rounded.

Female. Length 4 mm. Antennae extending to the third abdominal segment, dark brown, the basal segment thickly clothed ventrally with silvery scales; 22 or 23 segments, the fifth subsessile, subcylindric, with a length about twice the diameter; the distal two or three segments in the specimen described are fused into a spiral compound mass, the apex obtuse. Abdomen dark reddish brown, the segments sparsely margined posteriorly with pale yellowish hairs, the incisures deep red, the ovipositor pale fuscous yellowish, the venter dull reddish brown, the median sclerites a dark brown and sparsely clothed with short, silvery hairs. Wings hyaline, costa dark brown; the ovipositor at least one-half the length of the abdomen; terminal lobe long, broad, acute. Otherwise nearly as in the male. Type Cecid. a1399.

***Rhabdophaga cornuta* Walsh**

1864 **Walsh, B. D.** Ent. Soc. Phila. Proc., 3:624-26 (Cecidomyia)

1870 ——— Amer. Ent., 2:299 (*Eurytoma studiosa* Say, reared, Cecidomyia)

1906 **Felt, E. P.** Ins. Affect. Prk. & Wldd. Trees, N. Y. State Mus. Mem. 8, 2:735

This species appears to inhabit willow stems in very much the same way as the preceding midge. It is possible that they are closely related. The larva, according to Walsh, bores cylindric holes into the solid wood of the largest willow, *Salix*, stems. They generally work rather close to the point from which galls of *R. brassicoides* arise and usually where the growth of a good sized willow stem has been arrested. These midge larvae produce elongate, oval swellings. The interior of the galleries is always much blackened and discolored. The first sign of infestation is usually the circular exit hole. It is recorded as very rare near Rock Island, Ill. We have observed a very similar gall rather commonly on willow at West Nyack, N. Y., though we have been unable to rear a midge therefrom. *Eurytoma studiosa* Say was reared from the gall of this species.

Rhabdophaga rhodoides Walsh

- 1864 **Walsh, B. D.** Ent. Soc. Phila. Proc., 5:586-88
1867 ———— Ent. Soc. Phila. Proc., 6:224
1896 **Marlatt, C. L.** U. S. Dep't Agric., Div. Ent., Tech. Ser. 3, p. 22
(*Nematus inquilinus* reared from gall)
1906 **Felt, E. P.** Ins. Affect. Prk & Wldd. Trees, N. Y. State Mus.
Mem. 8, 2:745

This rather large, loose gall on willow, *Salix*, appears to be the work of a western or central species, since we have it only from Illinois and Aweme, Manitoba.

Gall. The midges undoubtedly winter in the gall. Specimens of this gall in the Museum of Comparative Zoology at Cambridge, Mass., show that the head is much looser than is the case with the gall produced by *R. strobiloides* and that the distal third of the central leaves is free, while most of the basal leaves are entirely so. The gall is smaller and the aborted leaves shorter and more compact than they are in the deformity produced by *Rhabdophaga coryloides*.

Male. Length 3.5 mm. Antennae about as long as the body, reddish brown; 25 segments, the fifth with a stem about one-half the length of the basal enlargement, which latter has a length twice its diameter; terminal segment fused with the preceding. Palpi; first segment with a length about three times its diameter, the second twice the length of the first, the third a little longer than the second, more slender, the fourth about as long as the second, slender. Mesonotum dark brown, submedian lines sparsely haired. Scutellum reddish brown, postscutellum yellowish brown. Abdomen rather thickly haired, dark reddish brown. Wings hyaline, costa dark brown. Halteres brownish basally, yellowish white apically. Coxae dark brown; femora, tibiae and tarsi yellowish brown, the distal segments somewhat darker; claws stout, strongly curved, the pulvilli longer than the claws. Genitalia; basal clasp segment long, slender, terminal clasp segment long; dorsal plate long, deeply and triangularly incised; ventral plate long, deeply and triangularly emarginate. Harpes long, broadly rounded.

Female. Length 5 mm. Antennae extending to the second abdominal segment, reddish brown; 29 sessile segments, the fifth with a length about twice its diameter; terminal segment tapering distally and slightly fused with the preceding. Palpi; first segment with a length about two and one-half times its diameter, the second a little longer, the third one-half longer than the second, more slender, the fourth about as long as the third, slightly dilated. Ovipositor about one-quarter the length of the abdomen, terminal lobes with a length about two and one-half times the diameter, narrowly rounded. Cecid. 1247.

Rhabdophaga strobiloides Walsh

- 1862 **Osten Sacken, C. R.** Mon. Dipt. N. A., 1:203 (Cecidomyia)
 1864 **Walsh, B. D.** Ent. Soc. Phila. Proc., 3:580-82 (Cecidomyia)
 1867 ——— Ent. Soc. Phila. Proc., 6:269 (*Apion lanuginosum* (walshii) reared, Cecidomyia)
 1869 **Riley, C. V. & Walsh, B. D.** Am. Ent., 1:105 (Cecidomyia)
 1869 **Packard, A. S.** Guide to the Study of Insects, p. 377 (Cecidomyia)
 1870 **Walsh, B. D.** Am. Ent., 2:299 (*Eurytoma studiosa* Say reared, Cecidomyia)
 1874 **Glover, Townend.** MS. Notes from My Journal, pl. II. fig. 15 (Cecidomyia)
 1884 **Smith, J. B.** Am. Ent. Soc. Trans., 11:57-58 (*Apion walshii* Smith reared, Cecidomyia)
 1890 **Riley, C. V. & Howard, L. O.** Ins. Life, 2:353 (*Chelonus parvus* Say reared, Cecidomyia)
 1892 **Beutenmueller, William.** Am. Mus. Nat. Hist. Bul. 4. p. 267-68 (Cecidomyia)
 1894 **Comstock, J. H.** Man. for the Study of Insects, p. 455 (Fig.)
 1896 **Marlatt, C. L.** U. S. Dep't Agric. Div. Ent., Tech. Ser. 3, p. 22 (*Nematus pomum* reared, Cecidomyia)
 1900 **Smith, J. B.** List Ins. N. J., p. 620 (Cecidomyia)
 1904 **Beutenmueller, William.** Am. Mus. Nat. Hist. Guide Leaflet 16, p. 28 (Cecidomyia)
 1904 **Cook, M. T.** Dep't Geol. Nat. Res. Ind. 29 Rep't, p. 840 (Cecidomyia)
 1906 **Felt, E. P.** Ins. Affect. Prk. & Wldd. Trees, N. Y. State Mus. Mem. 8, 2:639, 746
 1907 **Jarvis, T. D.** Ent. Soc. Ont. 37th Rep't, p. 66
 1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 355, 356
 1909 ——— Ent. Soc. Ont. Rep't, p. 92 (Cecidomyia)
 1909 **Brodie, William.** Can. Ent., 41:249-51
 1910 **Cook, M. T.** Mich. Geol. & Biol. Surv. Pub. 1, Biol. Ser. 1, p. 31 (Cecidomyia)
 1910 **Stebbins, F. A.** Springf. Mus. Nat. Hist. Bul. 2, p. 11
 1912 **Cosens, A.** Canad. Inst. Trans., 9:325

This gall is a somewhat common one in New York State and New England. The dark brown adults pass the winter as larvae in the gall, appearing in early spring. *Polygnotus* species was reared from this gall.

Gall. This is a loose, cabbagelike apical deformity some 2 to 2½ cm in diameter and about 3 to 4 cm long. The bracts give shelter to the larvae of several inquilines.

Male. Length 4 mm. Antennae about two-thirds the length of the body, dark brown; 23 segments, the fifth with a stem about three-quarters the length of the basal enlargement; terminal segment somewhat prolonged. Palpi; first segment irregularly subquadrate, slightly swollen distally, the second longer, a little stouter, the third a little shorter and more slender than the second, the fourth about one-third longer than the third, more slender; face

fuscous. Mesonotum dark brown, the submedian lines thickly clothed with long, gray setae. Scutellum dark brown or black with numerous long, gray setae apically, postscutellum dark brown. Abdomen dark brown, incisures dull red, the segments margined posteriorly, especially laterally, with long, grayish white setae; venter rather thickly clothed with short, silvery setae. Wings hyaline, costa dark brown. Halteres a dull salmon, fuscous subapically. Legs a variable gray, the femora and tibiae with sparse, irregular dark brown markings; tarsi dark brown or black; claws rather short, stout, strongly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment swollen at the base; dorsal plate broad, deeply and triangularly incised; ventral plate long, stout, deeply and rather broadly emarginate. Harpes long, stout, convolute, obliquely truncate.

Female. Length 4 to 5 mm. Antennae extending to the third abdominal segment, dark brown; 25-26 subsessile subcylindric segments, the two terminal ones usually fused, subobtusely distally. Ovipositor reddish brown; venter with the median sclerites dark brown, sparsely clothed with short, silvery hairs, the sublateral areas suffused with the same. Legs somewhat variable yellowish or reddish brown, the femoral and tibial articulations deep red; tarsi normally dark brown. Ovipositor about one-half the length of the abdomen, the terminal lobe broad, tapering, narrowly rounded. Otherwise nearly as in the male. Cecid. at 442.



Fig. 17 *Rhabdophaga strobiloides*, typical gall (natural size, original)

***Rhabdophaga brassicoides* Walsh**

Willow cabbage gall

- 1864 **Walsh, B. D.** Ent. Soc. Phila. Proc., 3:577-80 (Cecidomyia)
 1869 **Packard, A. S.** Guide to Study of Ins., p. 377 (Cecidomyia)
 1870 **Walsh, B. D.** Amer. Ent., 2:299 (*Eurytoma studiosa* Say, reared, Cecidomyia)
 1890 **Cockerell, T. D. A.** Entomologist, p. 280 (Cecidomyia)
 1892 **Beutenmueller, William.** Am. Mus. Nat. Hist. Bul. 4, p. 268 (Cecidomyia)
 1895 **Townsend, C. H. T.** Can. Ent., 27:205-7 (Cecidomyia)
 1896 **Marlatt, C. L.** U. S. Dep't Agric., Tech. Ser. 3, p. 22 (*Pteronuse mendicus*, reared, Cecidomyia)
 1900 **Smith, J. B.** List Ins. N. J., p. 620 (Cecidomyia)
 1906 **Felt, E. P.** Ins. Affect. Pk. & Wldd. Trees, N. Y. State Mus. Mem. 8, 2:563, 567, 745, 746 (Cecidomyia)

1908 **Jarvis, T. D.** Ent. Soc. Ont., 38th Rep't, p. 87

1909 ———— Ent. Soc. Ont., 39th Rep't, p. 91

1910 **Stebbins, F. A.** Springf. Mus. Nat. Hist. Bul. 2, p. 11

This small, close apical gall on willow is very common in New York State. The larvae inhabit a large central cell and transform to adults in early spring. The male has 23 antennal segments, the fifth with a stem three-quarters the length of the basal enlargement. The female has 24 antennal segments, the fifth with a length about one-quarter greater than its diameter.

Gall. Length and diameter approximately 1 to 2 cm. This is a close, apical gall and is composed of a series of broad, appressed rudimentary leaves.

Male. Length 3.5 mm. Antennae nearly as long as the body, light brown fuscous basally, 23 segments, the fifth with a stem about three-fourths the length of the basal enlargement, which latter has a length slightly greater than its diameter; terminal segment frequently somewhat reduced and partially fused with the preceding. Palpi; first segment rather short, slightly swollen distally, with a length fully twice its diameter, the second cylindric, one-half longer than the first, the third as long as the second, and the fourth a little longer than the third, all nearly equal in size, thickly clothed with narrow scales and sparsely so with stout setae; face fuscous, sparsely clothed with yellowish setae, obscurely margined posteriorly with fine, yellowish hairs. Mesonotum dark brown, the submedian lines and lateral margins thickly clothed with rather long, spreading yellowish setae. Scutellum a deep red with numerous yellowish setae apically, postscutellum darker. Abdomen dark brown, rather thickly and uniformly clothed with yellowish setae. Genitalia slightly darker. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous yellowish apically, dark brown subapically. Legs a fuscous yellowish basally, the tarsi mostly dark brown; claws long, stout, strongly curved, the puvilli longer than the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment long, slender; dorsal plate broad, deeply and rather broadly incised; ventral plate long, broad, deeply and triangularly emarginate. Harpes long, narrow, obtuse, apically a heavy, broad, subquadrate, chitinous process.

Female. Length 4 mm. Antennae extending to the third abdominal segment, dark brown; 24 segments, the fifth cylindric, subsessile, with a length about one-fourth greater than its diameter, the last segment prolonged. Scutellum dark brown with numerous pale yellowish setae apically, postscutellum a reddish brown. Abdomen dark brown, the segments margined posteriorly with rather long, whitish hairs, most abundant laterally, incisures deep red, venter sparsely suffused with silvery white scales, yellowish red, the median sclerites dark brown. Ovipositor about one-half the length of the abdomen, the terminal lobes long, stout, broadly rounded. Otherwise nearly as in the male. Cecid. a1433.

DASYNEURA Rond.

Perrisia Rond.*Dichelomyia* Rubs. in part.*Neocerata* Coq.

- 1846 **Rondani, Camillo.** Nouv. Ann. Sci. Nat. Bologna, S. 2, 6:371
(p. 371, footnote *Perrisia* proposed, type *C. urticae*)
- 1850 **Loew, H.** Dipt. Beitr., 4:20 (*Cecidomyia*)
- 1861 **Rondani, Camillo.** Atti Soc. Ital. Sci. Milano 2:2
- 1862 **Osten Sacken, C. R.** Dipt. N. Am. Mon., 1:175 (*Cecidomyia*)
- 1864 **Schiner, J. R.** Fauna Austriaca Dipt., 2:369 (*Cecidomyia*)
- 1876 **Bergenstamm, J. E. & Low, Paul.** Syn. Cecidomyidarum, p. 23
- 1877 **Karsch, F. A. F.** Revis. Gallmucken, p. 15
- 1888 **Skuse, F. A. A.** Linn. Soc. N. S. Wales Proc., 3:37, 38, 42, 43, 60,
61 (*Cecidomyia*)
- 1892 **Rubsaamen, E. H.** Berl. Ent. Zeit., 37:346 (*Dichelomyia* in part)
- 1892 **Theobald, F. V.** Acct. Brit. Flies, p. 50, 52 (*Cecidomyia*)
- 1895 **Kieffer, J. J.** Wien. Ent. Zeit., 15:86
- 1896 ———— Soc. Ent. Fr. Bul., 65:189 (*Bertieria*)
- 1897 ———— Syn. Cecid. Eur. & Alg., p. 6 (*Perrisia*)
- 1900 **Coquillett, D. W.** U. S. Dep't Agr., Bur. Ent. Bul. 22, n. s.,
p. 44 (*Neocerata*)
- 1900 **Kieffer, J. J.** Soc. Ent. Fr. Ann., 69: 440
- 1901 ———— Suite Syn. Cecid. Eur. & Alg., p. 16 (*Neocerata*)
- 1904 ———— Soc. Sci. Brux. Ann., 38: 13 (*Perrisia*)
- 1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 340-42
- 1910 **Rubsaamen, E. H.** Zeitsch. Wissenschaft. Insektenbiol., 15:337
- 1911 **Felt, E. P.** N. Y. Ent. Soc. Jour., 19:43

This genus comprises a large number of medium and rather small, usually dark brown insects which breed by preference in leafy tissues. The group intergrades with *Rhabdophaga* and the more typical forms may be distinguished therefrom by the heavy, nearly uniform third vein uniting with the margin well before the apex of the wing. The type is *Dasineura luteofusca* Rond.

There has been in earlier years a most unfortunate disagreement as to the concept represented by the genus *Cecidomyia*. A number of the earlier authors have insisted on applying this generic designation to a series of species which we have referred to this genus and its allied forms. Contemporaries of some of these earlier writers have insisted, and we believe rightfully, that *Cecidomyia* could be applied only to a series of insects represented by the *Cecidomyia pini* of DeGeer and have used the term *Dasyneura* for species referable to this group. The consequence has

been that some writers have employed the designation of Cecidomyia to represent a certain group of insects, while others have used it in a totally different sense. The type of the genus *D. sisymbrii* Schrnk. is a well-known species, and a study of its structures should forever obviate any further danger of confusion



Fig. 18 *Dasyneura gibsoni*, showing the general characteristics of the genus (much enlarged, original)

with the more typical Cecidomyia. The generic term *Perrisia*, proposed by Rondani in 1846 for *D. urticae* Perris, agrees so closely with *D. sisymbrii* Schrnk. that we are unwilling to accord it generic rank, despite the fact that there are certain well-marked antennal differences between the two.

Key to species

a Third vein distinctly curved anteriorly

b 9 antennal segments; abdomen yellowish. Reared from rose..
rhodophaga Coq., C. 21390

bb 10 antennal segments, females

c Abdomen pale yellowish; scutellum reddish brown;
 antennal segments sessile, the fifth with a length twice
 its diameter, the terminal one with a length four times
 its diameter; ovipositor lobes short, stout.....
maculosa Felt, C. 288

bbb 12 antennal segments, sessile or subsessile

c Abdomen and scutellum deep carmine; the fifth antennal
 segment with a length twice its diameter, the terminal
 one with a length six times its diameter; lobes of the
 ovipositor with a length three times their width, female.
 Reared from solidago.....*carbonaria* Felt, C. 713

cc Abdomen and scutellum dark reddish brown, the fifth
 antennal segment with a length one-half greater than
 its diameter, the terminal one with a length five times its
 diameter; lobes of the ovipositor with a length four
 times their width, female. Taken on New Jersey tea...
vernalis Felt, C. 262

ccc Abdomen dark reddish salmon; scutellum red; fifth
 antennal segment with a length two and one-half times
 its diameter, the terminal segment not produced,
 male.....*bidentata* Felt, C. 345

bbbb 13 antennal segments, sessile or subsessile, females

c Abdomen fuscous yellowish, unicolorous; scutellum light
 reddish brown; fifth antennal segment with a length
 one-half greater than its diameter; ovipositor as long as
 the abdomen, the lobes with a length four times their
 width. Reared from ash.....
fraxinifolia Felt, C. 21648a

cc Abdomen fuscous yellowish basally, yellowish apically;
 scutellum fuscous yellowish; fifth antennal segment
 with a length twice its diameter, the terminal one
 greatly produced; ovipositor one-half the length of
 abdomen, the oval lobes with a length thrice their
 width. Reared from tumid gall on grape.....
vitis Felt, C. 21165b

ccc Abdomen yellow, thorax tinged with red. Reared from
 root gall on Rhus.....*rhois* Coq.

cccc Abdomen dark red; scutellum reddish brown; fifth an-
 tennal segment with a length three times its diameter;
 the terminal segment produced, the ovipositor nearly as
 long as the abdomen.....*kärnerensis* Felt, C. 128

cccc Abdomen and scutellum reddish brown; fifth antennal
 segment with a length two and one-half times its diam-
 eter, the terminal segment produced.....
spiraeina Felt, C. 133

- cccccc* Abdomen dark orange; scutellum dark brown; fifth antennal segment with a length two and one-half times its diameter, the terminal one with a length four times its diameter; ovipositing in June grass.....
graminis Felt, C. 1209
- bbbbbb* 14 antennal segments
- c* Females; antennal segments sessile; ovipositor long
- d* Abdomen yellowish or yellowish orange
- e* Abdomen light yellowish; scutellum pale yellowish; fifth antennal segment with a length one-half greater than its diameter; lobes of the ovipositor long, nearly oval, hardly tapering distally, the fourth palpal segment nearly twice the length of the third. Reared from loose bud gall on peppermint.....
piperitae Felt, C. a1663a
- ee* Abdomen fuscous yellowish; scutellum light reddish brown; fifth antennal segment with a length one-half greater than its diameter, the fourth palpal segment one-half longer than the third; lobes of the ovipositor with a length four times their width. Reared from ash.....
fraxinifolia Felt, C. a1648a
- eee* Abdomen light yellowish red; scutellum yellowish carmine; fifth antennal segment with a length one-half greater than its diameter, the third and fourth palpal segments subequal, the lobes of the ovipositor very long, with a length seven times their width.....*borealis* Felt, C. 160
- cccc* Abdomen yellowish brown; scutellum reddish brown; fifth antennal segment with a length twice its diameter, terminal antennal segment much produced, the third and fourth palpal segments equal; terminal lobes of the ovipositor long, slender and narrowly oval. Reared from acorns.....*glandis* Felt, C. 1030
- dd* Abdomen dark brown
- e* Scutellum fuscous red; fifth antennal segment with a length twice its diameter, tapering distally, the third and fourth palpal segments nearly equal.....*aurihirta* Felt, C. 509
- ee* Scutellum yellowish brown; fifth antennal segment with a length one-third greater than its diameter, the fourth palpal segment one-half longer than the third. Reared from blackberry blossoms.....*rubiflorae* Felt, C. 990
- ccc* Scutellum fuscous yellowish; fifth antennal segment with a length twice its diameter, the fourth palpal segment one-half longer than the third. Reared from a loose bud gall on anemone.....
anemone Felt, C. a1522

cc Males; antennal segments stemmed

d Fifth antennal segment with a stem one-third the length of the basal enlargement

c Abdomen dark brown; scutellum yellowish; terminal clasp segment of the male genitalia short, and relatively stout.....

photophila Felt, C. 194

cc Abdomen yellowish brown; scutellum pale yellowish; terminal and basal clasp segments long and slender. Reared from Yucca.....

yuccae Felt, C. 1053

dd Fifth antennal segment with a stem three-fourths the length of the basal enlargement

e Abdomen fuscous yellowish, unicolorous; basal enlargement of the fifth antennal segment with a length one-half greater than its diameter, the fourth palpal segment three-fourths longer than the third, the dorsal plate deeply and triangularly incised..fraxinifolia Felt, C. 21648a

cc Abdomen fuscous yellowish basally and apically, the middle segment dark brown, the basal enlargement of the fifth antennal segment with a length twice its diameter, the fourth palpal segment one-third longer than the third, the dorsal plate narrowly incised.....

ampelophila Felt, C. 449

ccc Abdomen light brown; scutellum yellowish brown; basal enlargement of the fifth antennal segment with a length one-fourth greater than its diameter, the fourth palpal segment one-half longer than the third, the dorsal plate deeply and triangularly incised. Reared from blackberry blossoms....rubiflorae Felt, C. 990

cccc Abdomen dark brown

f Basal enlargement of the fifth antennal segment with a length twice its diameter; terminal segment with a distinct process...

setosa Felt, C. 750

ff Basal enlargement of the fifth antennal segment with a length one-half greater than its diameter; terminal segment narrowly oval, with the apical process rudimentary or wanting; palpi rather slender; basal tooth of the claw very long

g Basal clasp segment stout, with a length three times its diameter, tapering distally
unguicula Felt, C. 1225, 712, 745, 749

gg Basal clasp segment slender, with a length four times its diameter, hardly tapering distally.....pudorosa Felt, C. 279

- fff* Basal enlargement of the fifth antennal segment with a length one-fourth greater than its diameter, palpi rather stout, the fourth segment one-fourth longer than the third, the tooth of the claw relatively short.....
simulator Felt, C. 445, 627
- ddd* Fifth antennal segment with a stem as long as the basal enlargement
- e* Abdomen reddish brown; scutellum fuscous brown; fourth palpal segment one-fourth longer than the third. Reared from folded leaves of *Lupinus*.....*trifolii* Loew, C. 1034
- bbbbbb* 15 antennal segments
- c* Females; segments sessile
- d* Abdomen dark brown; scutellum reddish brown; fifth antennal segment with a length two and one-half times its diameter; ovipositor not longer than the body, the lobes with a length about five times their width.....*trifolii* Loew, C. 456, 742
- dd* Abdomen dark brown; scutellum brownish red; fifth antennal segment with a length two and one-half times its diameter; ovipositor distinctly shorter than the body, the lobes with a length about three times their width. Reared from apical bud gall on blueberry.....*cyanococci* Felt, C. 1700
- ddd* Abdomen pale yellowish; scutellum pale orange; fifth antennal segment with a length one-half greater than its diameter; ovipositor longer than the body, the lobes with a length four times their width.....
flavescens Felt, C. 601
- cc* Males; antennal segments stemmed
- d* Fifth antennal segment with a stem one-half the length of the basal enlargement
- e* Abdomen brownish black; genitalia yellow. Reared from a root gall on *Rhus*.. *rhoeis* Coq.
- dd* Fifth antennal segment with a stem three-fourths the length of the basal enlargement
- e* Abdomen light fuscous yellowish; scutellum pale orange, the basal enlargement of the fifth antennal segment with a length twice its diameter; the fifteenth reduced. Reared from *Clematis*...
clematidis Felt, C. 1659
- cc* Abdomen yellowish red; scutellum yellowish; the basal enlargement of the fifth antennal segment with a length one-fourth greater than its diameter, the fifteenth produced and with a length three times its diameter.....
filicis Felt, C. 43
- ccc* Abdomen dark brown, the basal enlargement of the fifth antennal segment with a length one-

half greater than its diameter, the fifteenth not produced, nearly oval. Reared from a loose apical bud gall on anemone.....

anemone Felt, C. a1522

ddd Fifth antennal segment with a stem as long as the basal enlargement

e Abdomen reddish brown; scutellum fuscous brown, the fourth palpal segment one-fourth longer than the third. Reared from folded leaves of white clover.....

trifolii Loew, C. 1032

bbbbbbb 16 antennal segments

c Females; antennal segments sessile

d Abdomen dark brown; scutellum reddish orange; fifth antennal segment with a length one-half greater than its diameter. Reared from pouch gall on narrow-leaved *Solidago*.....

flavicornis Felt, C. a1154

dd Abdomen dark brown; scutellum yellowish orange; fifth antennal segment with a length twice its diameter. Reared from rolled leaves of beach-pea.....

maritima Felt, C. a1895

ddd Abdomen reddish or light brown

e Abdomen reddish brown; scutellum fuscous yellowish; fifth antennal segment with a length twice its diameter. Reared from leaf gall on cranberry.....

vaccinii Smith, C. 957

ee Abdomen light brown; scutellum dark red; fifth antennal segment with a length one-half greater than its diameter.....

modesta Felt, C. 1200

dddd Abdomen yellowish

e Abdomen and scutellum pale yellowish; fifth antennal segment with a length one-half greater than its diameter. Reared from ash.....

apicata Felt, C. a1712

ee Abdomen fuscous yellowish; scutellum light fuscous yellowish; fifth antennal segment with a length three-fourths greater than its diameter. Reared from Clematis.....

clematidis Felt, C. a1659

eee Abdomen yellowish or reddish orange; fifth antennal segment with a length twice its diameter; reared from rolled *Smilax* leaves.....

smilacifolia Felt, C. a2214

cc Antennal segments stemmed

d Fifth antennal segment with a stem one-quarter the length of the basal enlargement

e Abdomen and scutellum yellowish red; fifth antennal segment with a length two and one-half times its diameter; female.....

caricis Felt, C. 111

- dd* Fifth antennal segment with a stem three-fourths the length of the basal enlargement; males
- c* Abdomen dark brown; scutellum reddish brown; basal enlargement of the fifth antennal segment with a length one-half greater than its diameter
quercina Felt, C. 47
- ee* Abdomen yellowish or reddish orange; basal enlargement of the fifth antennal segment with a length two and one-half times its diameter; reared from rolled smilax leaves.....
smilacifolia Felt, C. a2214
- eee* Abdomen reddish brown; basal enlargement of the fifth antennal segment with a length one-half greater than its diameter; reared from a midrib gall on Virginia creeper.....
parthenocissi Stebb. C. a2293
- ddd* Fifth antennal segment with a stem as long as the basal enlargement; males
- e* Abdomen reddish brown; scutellum fuscous yellowish; basal enlargement of the fifth antennal segment with a length two and one-half times its diameter, the third and fourth palpal segments equal. Reared from leaf gall on cranberry.....
vaccinii Smith, C. 957
- ee* Abdomen reddish brown; scutellum fuscous brown; basal enlargement of the fifth antennal segment with a length one-half greater than its diameter, the fourth palpal segment one-quarter longer than the third. Reared from folded leaves of white clover...
trifolii Loew
- dddd* Fifth antennal segment with a length one-quarter greater than the basal enlargement; males
- e* Abdomen yellowish brown; scutellum reddish brown; basal enlargement of the fifth antennal segment with a length two and one-quarter times its diameter.....
caricis Felt, C. 110
- bbbbbbbbb* 17 antennal segments
- c* Females; antennal segments sessile
- d* Abdomen dark brown; scutellum yellowish orange; fifth antennal segment with a length twice its diameter. Reared from rolled leaves of beach-pea
maritima Felt, C. a1895
- dd* Abdomen brown; fifth antennal segment with a length twice its diameter; reared from root gall on smilacina.....
smilacinae Bish., C. a2126
- ddd* Abdomen reddish brown; scutellum fuscous yellowish; fifth antennal segment with a length one-quarter greater than its diameter; ovipositor two-thirds the length of the abdomen, terminal lobes short and broad. Reared from *Lepidium*.....
lepidii Felt, C. 1035

dddd Abdomen dark reddish brown; fifth antennal segment with a length one-quarter greater than its diameter; ovipositor as long as the body; reared from a midrib gall on Virginia creeper.....
parthenocissi Stebb. C. a2293

cc Males; antennal segments stemmed

d Fifth antennal segment with a stem one-third the length of the basal enlargement, the latter with a length twice its diameter.....
smilacinae Bish., C. a2126

dd Fifth antennal segment with a stem one-half the length of the basal enlargement

e Abdomen pale yellowish; scutellum reddish brown; basal enlargement of the fifth antennal segment with a length twice its diameter. Reared presumably from the common tumid midrib gall on ash....
tumidosae Felt, C. a1532

ee Abdomen dark red, scutellum fuscous yellowish; basal enlargement of fifth antennal segment with a length one-half greater than its diameter; reared from western wild cherry fruit.....
pergandei Felt, C. 820p

bbbbbbbbbb 18 antennal segments

c Females; antennal segments sessile

d Abdomen pale reddish brown; scutellum dull brown; fifth antennal segment with a length one-half greater than its diameter; ovipositor as long as the body.....
multiannulata Felt, C. 261

dd Abdomen dark reddish brown; scutellum yellowish brown; ovipositor one-half the length of the body, stout, the terminal lobes very short and broad....
florida Felt, C. 1057

cc Males; fifth antennal segment with a stem three-quarters the length of the basal enlargement

d Abdomen light brown; scutellum yellowish, fuscous apically. Reared from rolled leaves of beach-pea
maritima Felt, C. a1895

bbbbbbbbbb 20 antennal segments

c Males; fifth antennal segment with a stem as long as the basal enlargement; abdomen yellowish. Reared from *Eugenia*.....
eugeniae Felt, a2258

aa Third vein straight or nearly so

b Antennal segments 11, sessile, the fifth with a length one-half greater than its diameter...
aberrata Felt, C. 1200a

bb Antennal segments 12, sessile, the fifth with a length one-half greater than its diameter; abdomen fuscous yellowish; scutellum reddish brown; ovipositor as long as the body, remarkably stout.....
cirsioni Felt, C. 619

bbb 13 antennal segments*c* Females; antennal segments sessile*d* Antennal segments cylindric or nearly so

e Abdomen dark brown; scutellum black; fifth antennal segment with a length twice its diameter
scutata Felt, C. 507

ee Abdomen dark brown; scutellum reddish brown; fifth antennal segment with a length one-quarter greater than its diameter, the terminal segment long, tapering, the fourth palpal segment one-half longer than the third.....
acerifolia Felt, C. 66

eee Abdomen light brown; scutellum dark brown; fifth antennal segment with a length one-half greater than its diameter; terminal segment produced, the palpi stout, the fourth segment shorter than the third; the legs are shorter and stouter than in *D. scutata*.....
albohirta Felt, C. 44

eeee Abdomen reddish brown; scutellum brown; fifth antennal segment with a length twice its diameter, the palpi slender, the fourth segment one-quarter longer than the third.....
similis Felt, C. 596

dd Antennal segments more or less oval

e Abdomen dark brown; scutellum reddish brown; fifth antennal segment with a length one-half greater than its diameter, terminal one with a length four times its diameter, the fourth palpal segment twice the length of the short third.....
antennata Felt, C. 213

ee Abdomen pale salmon; scutellum fuscous yellowish; fifth antennal segment with a length twice its diameter, the third and fourth palpal segments equal. Reared from spruce cones....
canadensis Felt, C. 21428

bbbb 14 antennal segments*c* Antennal segments sessile females*d* Abdomen dark brown; fifth antennal segment with a length one-quarter greater than its diameter

e Scutellum yellowish brown; fifth tarsal segment stout, with a length twice its diameter; lobes of the ovipositor stout, with a length about two and one-half times their width, tapering distally and narrowly rounded. Reared from leaves of honey locust, *Gleditschia*.....
gleditchiae O. S., C. 958

ee Scutellum dark brown; fifth tarsal segment with a length three times its diameter; lobes of the

ovipositor long, with a length about three times their width and tapering slightly. Reared from leaves of locust, Robinia.....

pseudacaciae Fitch, C. a1355

dd Abdomen reddish brown; fifth antennal segment cylindric, with a length one-half greater than its diameter; palpi quadriarticulate, the third and fourth segments equal; lobes of the ovipositor with a length thrice their width. Reared from bud gall on Salix.....*californica* Felt, C. 981

ddd Abdomen dark carmine; scutellum yellowish; fifth antennal segment oval, with a length about twice its diameter; wings very hairy, with peculiar obsolescent veins; claws minutely toothed; palpi short, stout, the segments subequal.....

denticulata Felt, C. 156

dddd Abdomen reddish orange; scutellum dark brown; fifth antennal segment with a length one-half greater than its diameter; palpi long, the fourth segment three-quarters longer than the third.....

augusta Felt, C. 737

cc The flagellate antennal segments stemmed .

d Fifth antennal segment with a stem one-quarter the length of the basal enlargement

e Abdomen dark brown; scutellum fuscous yellowish; basal enlargement of the fifth antennal segment with a length two and one-half times its diameter, lobe of the ovipositor narrowly lanceolate, with a length five times its width. Reared from rose.....

? rosarum Hardy, C. a1491

dd Fifth antennal segment with a stem one-third the length of the basal enlargement; male

e Abdomen brown; scutellum dark brown; wing very short, broad, with a width three-quarters its length, the basal enlargement of the fifth antennal segment with a length one-quarter greater than its diameter.....

acerifolia Felt, C. 72

ddd Fifth antennal segment with a stem one-half the length of the basal enlargement; male

e Abdomen and scutellum dark brown; basal enlargement of the fifth antennal segment with a length twice its diameter, the fourth palpal segment a little longer than the third. Reared from locust, Robinia.....

pseudacaciae Fitch, C. a1355

dddd Fifth antennal segment with a stem three-quarters the length of the basal enlargement, male

- e* Abdomen dark yellowish brown, the basal enlargement of the fifth antennal segment with a length twice its diameter, the fourth palpal segment a little longer than the third. Reared from seed pods of violet.....
semenivora Beutm., C. a1830
- bbbb* 15 antennal segments
 - c* Antennal segments sessile; female
 - d* Abdomen dark reddish
 - e* Scutellum fuscous yellowish
 - f* Fifth antennal segment with a length twice its diameter, the fourth palpal segment with a length one-quarter greater than the third. Reared from bedstraw, *Galium*.....
americana Felt, C. a1678k
 - ff* Fifth antennal segment with a length two and one-half times its diameter; the fourth palpal segment longer than the third. Reared from a rosette willow gall.....
albovittata Walsh, a1442a
 - ee* Scutellum reddish, fifth antennal segment with a length two and one-half times its diameter; fourth palpal segment one-quarter longer than third. Reared from willow twigs.....
corticis Felt, C. a1966
 - dd* Abdomen dark brown
 - e* Scutellum yellowish and fuscous; fifth antennal segment with a length twice its diameter, the fourth palpal segment one-half longer than the third. Reared from willow, *Salix*.....
salicifolia Felt, C. a1675
 - ce* Scutellum fuscous yellowish; fifth antennal segment with a length one-half greater than its diameter. Reared from Canada thistle.....
gibsoni Felt, C. a2221
- ddd* Abdomen dull orange yellow; scutellum dark red; fifth antennal segment with a length two and one-half times its diameter, the fourth palpal segment one-half longer than the third..*fulva* Felt, C. 257
- cc* Antennal segments stemmed; male
 - d* Fifth antennal segment with a stem as long as the basal enlargement
 - e* Abdomen dark brown. Reared from a rosette willow gall.....*albovittata* Walsh, a1442a
 - dd* Fifth antennal segment with a length one-quarter greater than the basal enlargement
 - e* Abdomen dark brown. Reared from heads of Canada thistle.....*gibsoni* Felt, C. a2221

bbbbbb 16 antennal segments

c Antennal segments sessile; females

d Abdomen dark brown

e Scutellum fuscous yellowish; fifth antennal segment with a length one-half greater than its diameter, fourth palpal segment one-half longer than the third. Reared from bud gall on elm.....*ulmea* Felt, C. 880

ee Scutellum pale fuscous orange; fifth antennal segment with a length twice its diameter; ovipositor with a length one-half greater than the body. Reared from blossoms of Joe Pye weed..

purpurea Felt, C. 21693a

eee Scutellum yellowish brown

f Antennal segments cylindric

g Fifth antennal segment with a length about two and one-half times its diameter

h Ovipositor longer than the body, the lobes with a length about three and one-half times their width. Taken on clover.....

? leguminicola Lintn. C. 125,

114, 134, 740

hh Ovipositor as long as the body, the lobes with a length six times their width. Reared from small strobiloides bud gall on willow.....

gemmae Felt, C. 21937a

hhh Ovipositor as long as the body, the lobes with a length three times the width. Reared from clusters of root leaves of solidago.....

radifolii Felt, C. 21911

hhhh Ovipositor as long as the body, the lobes with a length four times the width. Reared from a rosette willow gall.....

albovittata Walsh 21442a

gg Fifth antennal segment with a length twice its diameter; ovipositor as long as the abdomen, the lobes with a length twice their width. Reared from distorted violet pods.....

semenivora Beutm., C. 21830

ggg Fifth antennal segment with a length three-fourths greater than its diameter; ovipositor as long as the body, the oval lobes with a length three and one-half times their width.....

communis Felt, C. 21133

- ff* Antennal segments slightly oval, the fifth with a length three-fourths greater than its diameter; ovipositor longer than the body, the lobes with a length four times their width
rufipedalis Felt, C. 127
- dd* Abdomen brown; scutellum dull red; fifth antennal segment with a length two and one-half times its diameter, ovipositor as long as the body. Reared from *Lysimachia*
lysimachiae Beutm., C. 1192
- ddd* Abdomen yellowish orange; scutellum yellowish white; fifth antennal segment with a length twice its diameter; ovipositor one-third longer than the body.....*flavoabdominalis* Felt, C. 738
- dddd* Abdomen dark red, scutellum fuscous orange; fifth antennal segment with a length three-fourths longer than its diameter; ovipositor as long as the abdomen. Reared from *Cercocarpus*.....
cercocarpi Felt, C. 12359
- cc* Antennal segments stemmed; males
- d* Fifth antennal segment with a stem three-fourths the length of the basal enlargement
- e* Abdomen and scutellum dark brown, the basal enlargement of the fifth antennal segment with a length one-half greater than its diameter.....
communis Felt, C. 11133
- ee* Abdomen reddish orange, scutellum fuscous yellowish; basal enlargement of the fifth antennal segment with a length twice its diameter. Reared from willow twigs...*corticis* Felt, C. 11966
- dd* Fifth antennal segment with a stem as long as the basal enlargement
- e* Abdomen dark brown
- f* Basal enlargement of the fifth antennal segment with a length one-fourth greater than its diameter. Reared from willow, *Salix*...
salicifolia Felt, C. 11675
- ff* Basal enlargement of the fifth antennal segment with a length three-fourths greater than its diameter. Reared from a rosette willow gall...*albovittata* Walsh, 11442a
- ee* Abdomen and scutellum reddish brown, basal enlargement of the fifth antennal segment with a length twice its diameter. Taken on clover....
? leguminicola Lintn., C. 125, 457
- cee* Abdomen brown; scutellum dull red; basal enlargement of the fifth antennal segment with a length one-half greater than its diameter. Reared from loose bud galls on *Lysimachia*....
lysimachiae Beutm., C. 11192, C. 1240

- ecce* Abdomen yellowish brown; scutellum fuscous yellowish, the basal enlargement of the fifth antennal segment with a length one-half greater than its diameter, the third and fourth palpal segments equal. Reared from mint.....
aromaticae Felt, C. a1875
- eeee* Abdomen yellowish red, scutellum reddish brown; the basal enlargement of the fifth antennal segment with a length one-half greater than its diameter; fourth palpal segment one-fourth longer than the third. Reared from *Cercocarpus*.....*cercocarpi* Felt, C. a2359
- ddd* Fifth antennal segment with a stem one-fourth longer than the basal enlargement
- e* Abdomen dark reddish orange; scutellum brown; basal enlargement of the fifth antennal segment with a length one-half greater than its diameter.....*attenuata* Felt, C. 1209b
- bbbbbbb* 17 antennal segments
- c* Antennal segments sessile; females
- d* Abdomen reddish brown; scutellum yellowish; fifth antennal segment with a length two and one-half times its diameter, the third and fourth palpal segments equal; ovipositor as long as the abdomen....
flavoscuta Felt, C. 553
- dd* Abdomen blood red; scutellum pale yellowish; fifth antennal segment with a length two and one-half times its diameter, the third and fourth palpal segments equal; ovipositor as long as the abdomen. Reared from *Lysimachia*.....
lysimachiae Beutm., C. 1240
- ddd* Abdomen fuscous orange; scutellum brownish orange; fifth antennal segment with a length twice its diameter, the fourth palpal segment one-half longer than the third; ovipositor two-thirds the length of the abdomen.....
consobrina Felt, C. 215
- cc* Antennal segments stemmed; males
- d* Fifth antennal segment with a stem three-quarters the length of the basal enlargement
- e* Abdomen dark brown; scutellum reddish brown; basal enlargement of the fifth antennal segment with a length three-quarters greater than its diameter.....*meliloti*. Felt, C. 744
- ee* Abdomen pale salmon; scutellum yellowish brown; basal enlargement of the fifth antennal segment with a length twice its diameter. Reared from spruce seeds.....
canadensis Felt, C. a1428

- dd* Fifth antennal segment with a stem one-quarter longer than the basal enlargement, the latter with a length two and one-half times its diameter
- c* Abdomen dark brown; scutellum reddish brown, the ventral plate broadly and roundly emarginate.....*pedalis* Felt, C. 410
- cc* Abdomen dark brown; scutellum reddish brown, the ventral plate deeply and roundly emarginate. Reared from clusters of root leaves of *solidago radifolii* Felt, C. 1911
- bbbbbbbbb* 18 antennal segments
- c* Antennal segments sessile; females
- d* Abdomen reddish brown. Reared from apical bud gall on alder.....*serrulatae* O. S., C. 876
- cc* Antennal segments stemmed; males
- d* Fifth antennal segment with a stem as long as the basal enlargement, the latter with a length twice its diameter; abdomen reddish brown. Reared from apical bud gall on alder.....*serrulatae* O. S., C. 876
- dd* Fifth antennal segment with a length one-fourth greater than the basal enlargement, the latter with a length one-half greater than its diameter; abdomen dark brown. Reared from small strobiloides bud galls on willow.....*gemmae* Felt, C. 1937a
- bbbbbbbbb* 19 antennal segments
- c* Abdomen reddish; male, the fifth antennal segment with a stem one-quarter longer than the basal enlargement, the latter with a length twice its diameter; female, the fifth antennal segment with a length thrice its diameter. Reared from axillary galls on *Hypericum mutilum*.....*toweri* Felt, C. 1883

Dasyneura rhodophaga Coq.

- 1899 **Riley, C. V.** and **Howard, L. O.** Insect Life, 1:284. Injuries (as *Cecidomyia*)
- 1891 ——— Insect Life, 3:294-95. Injuries (as *Cecidomyia*)
- 1900 **Coquillett, D. W.** U. S. Dep't Agric., Div. Ent. Bul. 22 n. s., p. 44, 46, 47 (*Neocerata*)
- 1904 **Webster, F. M.** Ill. State Lab. Nat. Hist. Bul. 7, p. 15-25 (*Neocerata*)
- 1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 349
- 1912 **Davis, J. J.** Ins. Ill. 27th Rept., p. 106-113 (*Neocerata*)

This species was first brought to notice on account of its injuring roses in association with *Diplosis rosivora* Coq., the attack for some reason being confined to Meteor, Wooten, La France, Madame Chatenay, Bride, Ivory and Golden Gate. The injury was

most severe to the first named variety and more prevalent in older than in newer greenhouses. Later investigations show injury to other roses, especially to all "hybrid teas." The midges were so abundant at times as to destroy the entire crop of rose buds. Though the antennae depart somewhat from the *Dasyneura* type, we believe the species should be referred to this genus.

Male. Length 1 mm. Antennae short, 9 subsessile segments, the fifth with a length only a little greater than its diameter, the last segment greatly produced, with a length about four times its diameter. Palpi; the first segment short, the second broadly oval, the third one-half longer, dilated, the fourth as long as the third, slender. Head and thorax brown, the abdomen, in alcoholic specimens, yellowish. Wings hyaline, costa dark brown, third vein curving forward. Claws long, slender, the pulvilli a little shorter than the claws. Genitalia; basal clasp segment slender; terminal clasp segment long, slightly swollen basally; dorsal plate broad, deeply and narrowly incised, ventral plate long, broadly and roundly emarginate. Harpes long, subtruncate and irregularly tuberculate.

Female. Length 1 to 1.25 mm. Antennae short; 9 subsessile segments, the fifth with a length nearly twice its diameter, the terminal segment greatly produced, with a length about five times its diameter. Ovipositor nearly as long as the abdomen, the terminal lobes narrowly oval, tapering. Other characters presumably as in the opposite sex.

The above descriptions were drafted from specimens received from Prof. S. A. Forbes, state entomologist of Illinois, in connection with the original descriptions by Mr Coquillett.

Life history. This species was closely studied by Professor Webster who failed to find it on wild roses even in the vicinity of infested rose houses. The damage is caused between May and October. The eggs are deposited under and near the base of the sepals and occasionally in the sutures separating the sepals. Not infrequently a female perishes with her ovipositor inextricably fixed in a bud. The young larvae are white, the older ones reddish. Twenty-five may be found in one blossom. Fumigation with .10 and .15 grams of potassium cyanide to each cubic foot of space for a period of 15 minutes killed only exposed larvae. The maggots desert the blossoms and undergo their final transformations in a nearly transparent cocoon in the soil. Cecid. 21390.

Dasyneura maculosa Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 341

This species was taken on a window at Nassau, N. Y., June 14, 1906.

Female. Length .75 mm. Antennae extending to the base of the abdomen, light brown; 10 segments, the fifth subsessile; terminal segment slightly prolonged, tapering to an obtusely rounded apex. Palpi; the first segment short, subquadrate, the second irregularly suboval, the third one-half longer than the second, narrowly oval, the fourth one-half longer than the third, a little more slender, the fifth one-half longer than the fourth, more slender. Mesonotum nearly uniform dark brown. Scutellum reddish brown. Abdomen pale yellowish, irregularly mottled with dark brown (the normal color is probably a nearly uniform dark brown), terminal segments pale orange. Wings subhyaline, costa dark brown; halteres pale reddish basally, whitish apically. Legs nearly uniform pale straw, except that the anterior tarsi appear to be dark brown; claws long, slender, rather strongly curved. Ovipositor nearly as long as the body, terminal lobes short, broadly rounded. Type Cecid. 288.

Dasyneura carbonaria Felt

1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 117 Separate, p. 21

1908 ——— N. Y. State Mus. Bul. 124, p. 341

1909 ——— Ottawa Nat., 22:248

This species was reared at Albany, N. Y., from the narrow-leaved Solidago, *S. graminifolia* July 27, 1906, probably from a loose apical gall though the plant was infested with the blister galls of *Baldratia carbonifera* Felt.

Female. Length 1.25 mm. Antennae extending to the base of the abdomen, dark brown; 12 segments fifth subsessile, with a length twice its diameter; terminal segment more than twice the length of the preceding, the basal four-fifths subcylindric, the distal part narrow, broadly rounded. Palpi; the first and second segments short, stout, the third one-half longer than the second, the fourth one-half longer than the third. Mesonotum dark brown, submedian lines indistinct. Scutellum, postscutellum and abdomen deep carmine, the scutellum, postscutellum and basal and terminal abdominal segments tinged with yellowish. Wings hyaline, costa dark brown, halteres yellowish basally, slightly fuscous apically. Legs nearly uniform dark brown; claws rather stout, slightly curved. Ovipositor probably two-thirds the length of the body, the terminal lobes slender, elliptical. Type Cecid. 713.

Dasyneura vernalis Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 341

This species was taken at Nassau, N. Y., June 14, 1906 on New Jersey tea, *Ceanothus americanus*.

Female. Length 1 mm. Antennae extending to the second abdominal segment, rather sparsely haired, dark brown, 12 segments, fifth subsessile, with a length one-half greater than its diameter,

terminal segment greatly prolonged, more than twice the length of the preceding, obtusely rounded distally. Palpi; the first segment subquadrate, the second as long as the first, more slender, the third one-half longer, more slender and the fourth a little shorter than the third. Mesonotum uniform dark brown, submedian lines pale yellowish, sparsely ornamented with fine setae. Scutellum dark reddish brown with numerous reddish apical setae, postscutellum reddish brown. Abdomen dark reddish brown, sparsely clothed with fine, yellowish hairs, terminal segments fuscous yellowish. Wings hyaline, costa dark reddish brown; halteres yellowish transparent. Coxae and femora pale straw color, tibiae and tarsi nearly uniform reddish brown; claws stout, strongly curved. Ovipositor nearly as long as the body, terminal lobes long, stout, broadly rounded. Type Cecid. 262.

Dasyneura bidentata Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 114 Separate, p. 18

1908 ——— N. Y. State Mus. Bul. 124, p. 341

This species was taken on white oak, *Quercus alba*, at Albany, N. Y., June 21, 1906.

Male. Length 1.25 mm. Antennae extending to the base of the abdomen, dark brown, fuscous yellowish basally; 13 segments, the fifth subcylindric, the length about one and one-half times the diameter. Palpi; first segment short, almost obconic, second a little longer, third more so and the fourth one-half longer than the third. Face fuscous yellowish. Mesonotum dark brown with distinct submedian lines, sparsely ornamented with pale setae. Scutellum rather dark red or yellowish orange, postscutellum dark red. Abdomen a reddish or dark salmon, segments margined with pale yellowish posteriorly. Genitalia slightly fuscous. Wings subhyaline, costa light brown. Coxae and basal portion of femora pale yellowish, other parts of legs brownish; tarsi slightly darker, lighter ventrally; claws stout, strongly curved. Genitalia; basal clasp segment stout; terminal clasp segment stout; dorsal plate broad, deeply incised; ventral plate narrow, deeply emarginate. Harpes narrow, approximate distally. Type Cecid. 344, 345.

Dasyneura fraxinifolia Felt

1907 Felt, E. P. New species of Cecidomyiidae II, p. 12

1908 ——— N. Y. State Mus. Bul. 124, p. 293, 341

This species was reared August 1, 1907 from tightly rolled leaves of ash, *Fraxinus*, taken at Bath, N. Y.

Male. Length .75 mm. Antennae nearly as long as the body, thickly haired, brown, yellowish basally; 14 segments, the fifth with a stem two-thirds the length of the subcylindric basal enlargement, which latter has a length about one-fourth greater than its diameter, terminal segment somewhat produced, narrowly oval. Palpi; the

first segment rather short, stout, with a length about twice its diameter, the second a little longer, rounded at the extremities, the third one-fourth longer and more slender and the fourth one-half longer than the third, more slender, face yellowish. Mesonotum reddish brown, the submedian lines pale yellowish. Scutellum light reddish brown, postscutellum a little lighter. Abdomen fuscous yellowish, the second to seventh segments shaded with light brown; genitalia fuscous, venter light yellowish. Wings hyaline, costa dark brown. Halteres yellowish basally, light brown apically. Legs light straw, the distal tarsal segments darker; claws long, slender, strongly curved, the pulvilli nearly as long as the claws. Genitalia; basal and terminal clasp segments long, stout; dorsal plate short, broad, deeply and triangularly incised; ventral plate narrow, long, deeply and roundly emarginate; harpes broad at base, long, tapering.

Female. Length 1.5 mm. Antennae extending to the base of the abdomen, thickly haired, brown, yellowish basally; 13 subsessile segments, the fifth with a length one-half greater than its diameter; terminal segment somewhat produced, narrowly oval. Ovipositor pale yellowish, about as long as the body, the terminal lobes long, broad, narrowly rounded. Other characters as in the male. Type Cécid. a1648a.

***Dasyneura vitis* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 341

This species was reared July 16, 1907 from a tumid gall on grape *Vitis* sp., taken at West Nyack, N. Y., and presumed to be that of *Lasioptera vitis* O. S. This form is probably an inquiline.

Female. Length .75 mm. Antennae extending to the base of the abdomen, sparsely haired, dark brown; 13 sessile segments, the fifth with a length about two and one-half times its diameter; terminal segment much produced, with a length about four times its diameter, narrowly rounded. Mesonotum dark brown, the scutellum, postscutellum and basal abdominal segments fuscous yellowish, the distal ones yellowish. Wings hyaline, costa dark brown. Halteres yellowish basally, slightly fuscous apically. Legs a variable fuscous yellowish; claws long, slender, strongly curved, the pulvilli a little shorter than the claws. Ovipositor about one-third the length of the abdomen, stout, the lobe with a length nearly thrice its diameter, narrowly rounded. Type Cécid. a1165b.

***Dasyneura karnerensis* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 341

This species was taken June 4, 1906 on aster or solidago at Karner, N. Y.

Female. Length 1 mm. Antennae extending to the fourth abdominal segment, thickly haired, dark brown; 13 subcylindric segments, the fifth with a length three times its diameter; terminal

segment slightly prolonged, broadly rounded distally. Palpi; the first segment subquadrate, slightly incrassate, the second suboval, a little longer, the third one-half longer than the second, the fourth a little longer than the third; face reddish brown. Mesonotum dark brown, submedian lines clothed with fine hairs. Scutellum reddish brown, postscutellum and abdomen dark reddish. Wings hyaline, costa reddish brown; halteres yellowish transparent. Legs a nearly uniform pale brown; claws slender, slightly curved. Ovipositor three-fourths the length of the body, terminal lobe long, slender, broadly rounded. Type Cecid. 128.

***Dasyneura spiraeina* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 341.

This species was taken June 4, 1906 on *Spiraea* at Karner, N. Y.

Female. Length 1 mm. Antennae scarcely extending to the base of the abdomen, sparsely haired, dark brown; 13 subcylindric segments, the fifth with a length two and one-half times its diameter; terminal segment slightly prolonged, suboval. Palpi; the first segment short, subquadrate, the second about as long, oval, the third slender, twice the length of the second, the fourth a little longer than the third, flattened; face dark brown. Mesonotum dark brown, submedian lines ornamented with fine hairs. Scutellum, postscutellum and abdomen reddish brown. Wings hyaline, costa dark brown; halteres pale reddish transparent basally, whitish transparent apically. Legs nearly uniform pale brown, tarsi slightly darker; claws slender, uniformly curved. Ovipositor probably nearly as long as the body, terminal lobes long, slender, probably broadly rounded. Type Cecid. 133.

***Dasyneura graminis* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 342

This female was captured while ovipositing in red-top or June grass, *Agrostis vulgaris*, at Albany, N. Y., June 9, 1907. The midges were observed in numbers, May 29 and 31, 1908, at Kinderhook and Poughkeepsie respectively, ovipositing in June grass. The fragile adults would carefully insert the ovipositor between the glumes of the nodding heads. The females were very intent upon their work and could be readily watched under a hand lens.

Female. Length 1.5 mm. Antennae extending to the second abdominal segment, sparsely haired, brown; 13 subsessile segments, the fifth with a length about twice its diameter; terminal segment greatly produced, apparently composed of two closely fused segments, broadly rounded apically. Palpi; the first segment short, stout, subquadrate, slightly swollen basally, the second a little longer, stouter, the third one-half longer than the second, more slender, the

fourth one-half longer than the third; face fuscous. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum brown, postscutellum a little darker. Abdomen a deep reddish orange, the dorsal sclerites slightly darker, ovipositor pale yellowish. Wings hyaline, costa light brown. Halteres a pale orange. Legs a nearly uniform yellowish brown; claws long, slender, strongly curved, the pulvilli longer than the claws. Ovipositor about as long as the body, terminal lobe long, slender, narrowly rounded. Type Cecid. 1209.

Dasyneura piperitae Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 342

A pale yellowish green larva was observed in the enlarged terminal buds of peppermint, *Mentha piperita*, and adults were reared in early August 1907. Galls were rather common at Nassau, N. Y.

Female. Length .75 mm. Antennae extending to the fourth abdominal segment, sparsely haired, dark brown, yellowish basally; 14 sessile segments, the fifth with a length about twice its diameter, tapering slightly distally; terminal segment somewhat produced, with a length about three times its diameter, narrowly rounded. Palpi; the first segment short, stout, slightly expanded distally, the second narrowly oval, with a length about two and one-half times its diameter, the third one-half longer and more slender, the fourth nearly twice the length of the third, face yellowish. Mesonotum shining reddish brown. Scutellum and postscutellum pale yellowish. Abdomen light yellowish brown. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Legs a nearly uniform yellowish brown; claws long, slender, evenly curved, the pulvilli about as long as the claws. Ovipositor about as long as the abdomen, the terminal lobes with a length about four times the width, hardly constricted basally, narrowly rounded. Type Cecid. a1663a.

Dasyneura borealis Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 117. Separate, p. 21

1908 ——— N. Y. State Mus. Bul. 124, p. 342

This species was taken June 7, 1906 at Lake Clear, N. Y., while collecting from spruce, *Abies* species.

Female. Length 1 mm. Antennae extending to the middle of the abdomen, sparsely haired, dark brown; probably 14 subsessile segments, the fifth with a length one-half greater than its diameter. Palpi; the first segment subquadrate, the second stout, subrectangular, with a length two and one-half times the diameter, the third a little longer, subrectangular, the fourth one-fourth longer than the preceding, more slender. Mesonotum dark brown, lighter posteriorly, submedian lines yellowish, distinct. Scutellum yellowish carmine, postscutellum and abdomen light yellowish red. Wings

hyaline, costa light brown; halteres whitish transparent. Legs light brown, lighter ventrally, tarsi darker; claws stout, uniformly curved. Ovipositor about as long as the body, terminal lobes with a length seven times the width. Type Cecid. 160.

***Dasyneura glandis* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 342

This species, studied through the courtesy of the United States National Museum, was reared by Miss M. E. Murtfeldt of Kirkwood, Mo., October 20, 1896 from larvae found between the seed coats of an acorn, *Quercus* species.

Exuviae. Length 1.25 mm; antennal cases extending to the second abdominal segment, the wing cases nearly to the fourth abdominal segment and the leg cases almost to the tip of the abdomen. Cephalic horns long, slender. Near the base of the antennae, arising from conspicuous tubercles, are a pair of extremely long, slender setae. Dorsum of the abdomen thickly clothed with minute, chitinous points, the latter strongly developed near the anterior fourth of each segment. Color pale yellowish or whitish.

Female. Length 1 mm. Antennae extending to the fourth abdominal segment, sparsely haired, light brown; 14 sessile segments, the fifth with a length about two and one-half times its diameter; terminal segment greatly produced, with a length about five times its diameter and tapering to a narrowly rounded apex. Palpi; the first segment rather long, swollen near the distal third, the second narrowly oval, with a length over twice its diameter, the third one-half longer and more slender than the second, the fourth about twice as long as the third. Mesonotum dark brown. Scutellum reddish brown, postscutellum yellowish brown. Abdomen yellowish brown. Wings hyaline, costa dark brown. Halteres yellowish transparent. Legs mostly a light yellowish brown, the distal tarsal segments darker; claws long, slender, strongly curved, the pulvilli shorter than the claws. Ovipositor one-half longer than the body; terminal lobes with a length about three times the diameter, tapering, narrowly rounded. Type Cecid. 1030.

***Dasyneura aurihirta* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 342

This species was taken on New Jersey tea, *Ceanothus americanus*, at Albany, N. Y., July 6, 1906.

Female. Length 1.6 mm. Antennae extending to the fourth abdominal segment, sparsely haired, dark brown, yellowish basally; 14 subsessile segments, the fifth with a length over twice its diameter, slightly constricted near the basal third, tapering distally;

terminal segment produced, with a length about four times its diameter, subacute. Palpi; the first segment short, stout, swollen distally, the second stout, subrectangular, with a length about three times its diameter, the third one-half longer than the second, more slender, the fourth a little longer than the third, face yellowish. Mesonotum black, the submedian lines sparsely haired. Scutellum fuscous reddish, postscutellum dark brown. Abdomen dark brown, rather thickly clothed with pale golden hairs, especially laterally. Wings hyaline, costa dark brown. Halteres yellowish basally, reddish apically. Coxae fuscous brown, femora yellowish brown basally, fuscous apically; tibiae and tarsi mostly dark fuscous brown; claws long, slender, evenly curved, the pulvilli a little longer than the claws. Ovipositor about as long as the abdomen, the terminal lobes stout, with a length about three times the width, broadly rounded. Type Cecid. 509.

Dasyneura rubiflorae Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 343

This species, loaned for study through the courtesy of the United States National Museum, was reared April 20 and 26, 1886 from blossoms of blackberry, *Rubus* species.

Male. Length 1 mm. Antennae extending to the second abdominal segment, rather thickly haired, the apical three segments dark brown, the others mostly yellowish brown; 14 segments, the fifth with a stem three-fourths the length of the basal enlargement, which latter has a length about one-half greater than its diameter; terminal segment slightly produced, narrowly oval. Palpi; the first segment short, stout, irregular, the second narrowly oval, with a length about twice its diameter, the third one-half longer, more slender, and the fourth nearly twice the length of the third, more slender. Mesonotum dark brown. Scutellum yellowish brown, postscutellum yellowish. Abdomen a variable light brown, the incisures pale yellowish; genitalia fuscous. Wings hyaline, costa reddish brown. Halteres pale yellowish. Legs a variable yellowish, tarsi somewhat darker; claws long, slender, evenly curved, unidentate, the pulvilli as long as the claws. Genitalia; basal clasp segment short, slender; terminal clasp segment short, stout; dorsal plate long, broad, deeply and triangularly incised; ventral plate long, slender, deeply and triangularly emarginate. Harpes long, slender, tapering, irregularly truncate.

Female. Length 1 mm. Antennae hardly extending to the base of the abdomen, sparsely haired, dark brown; 14 segments, the fifth with a length about three-fourths greater than its diameter. Scutellum yellowish brown, postscutellum and abdomen dark brown. Ovipositor nearly as long as the body, the terminal lobes with a length about four times their width, tapering distally, narrowly rounded. Type Cecid. 990.

***Dasyneura anemone* Felt**

1907 **Felt, E. P.** New Species of Cecid. II, p. 11

1908 ——— N. Y. State Mus. Bul. 124, p. 292, 343

1909 ——— Ent. Soc. Ont. 39th Rep't, p. 45

This species was reared July 12, 1907 from a loose bud gall of *Anemone canadense* taken at Kinderhook and Nassau, N. Y.

Gall. Numerous pale orange larvae were found in the unfolding leaves inclosing an apparently normal though slightly enlarged bud.

Larva. The larva is 3 mm long, pale orange.

Male. Length 1.25 mm. Antennae about as long as the body, sparsely haired, reddish brown; 15 segments, the fifth with a stem about three-fourths the length of the basal enlargement, which latter has a length about one-half greater than its diameter; terminal segment reduced, narrowly oval. Palpi; the first segment short, stout, subquadrate, the second one-half longer, narrowly oval, the third one-half longer than the second, slender, the fourth one-half longer than the third, more slender. Head reddish yellow. Mesonotum dark brown, the narrow submedian lines yellowish. Abdomen dark brown, the incisures and pleurae yellowish, the venter reddish orange. Wings hyaline, costa dark brown. Halteres pale yellowish, femora pale yellowish basally, darker apically, the tibiae and tarsi dark brown, the latter almost black in some specimens; claws long, stout, strongly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment short, stout, the basal two-thirds swollen; dorsal plate long, broad, deeply and triangularly incised; ventral plate long, narrow, deeply and broadly emarginate. Harpes long, slender, irregular.

Female. Length 1.25 mm. Antennae extending to the second abdominal segment, sparsely haired, reddish brown; 14 segments, the fifth with a very short stem, the basal enlargement with a length about twice its diameter, a rather distinct constriction near the basal third; terminal segment greatly produced, with a distinct constriction near the distal third. Color characters about as in the male, except that the mesonotum is not so dark and the dorsal surface of the abdomen is more heavily clothed with darker hairs. Ovipositor a little longer than the body, very slender, the terminal lobes slightly constricted at the base, narrowly rounded. Other structural characters practically as in the opposite sex. Type Cecid. a1522.

***Dasyneura photophila* Felt**

1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 114. Separate, p. 18

1908 ——— N. Y. State Mus. Bul. 124, p. 343

This male was taken on a window at Nassau, N. Y., June 10, 1906.

Male. Length .75 mm. Antennae probably nearly as long as the body, sparsely haired, dark brown; probably 14 segments, the fifth

with a stem about one-fourth the length of the basal enlargement. Palpi; the second segment long, narrowly oval, the third a little longer, more slender, the fourth a little longer and more slender than the preceding; face dark brown, sparsely clothed with whitish hairs. Mesonotum dark brown. Scutellum yellowish, postscutellum and abdomen nearly uniform dark brown. Wings (pl. 6, fig. 2) hyaline, costa dark brown; halteres yellowish or orange yellow. Legs a nearly uniform dark brown; claws rather long, strongly and evenly curved. Genitalia; basal clasp segment stout, with a conspicuous rounded lobe internally at the basal third; terminal clasp segment stout. Dorsal plate short, very broad, apparently divided, the lobes widely separated at the base, broadly rounded; ventral plate broad, stout, apparently suborbicular. Harpes stout, subtriangular, apically with a long, subquadrate, chitinous process and several minor ones. Type Cecid. 194.

Dasyneura yuccae Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 343

This species, loaned for study through the courtesy of the United States National Museum, was reared September 12, 1893 from the pods of *Yucca angustifolia*.

Male. Length 1 mm. Antennae a little longer than the body, thickly haired, light brown; 14 segments, the fifth with a stem about one-half the length of the basal enlargement; terminal segment narrowly oval. Palpi; the first long, slender, with a length about three times its diameter, the second about as long as the first, narrowly oval, the third as long as the second, slightly more slender, the fourth one-half longer than the third, more slender. Mesonotum dark reddish brown. Scutellum and postscutellum pale yellowish. Abdomen yellowish brown. Wings hyaline, costa dark brown. Halteres yellowish transparent. Legs a variable fuscous yellowish, the femora distally, tibiae and tarsi dark brown; claws very long, slender, strongly curved, the pulvilli a little shorter than the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment long, slender; dorsal plate long, deeply and triangularly incised; ventral plate long, broad, broadly rounded. Harpes short, stout, roundly truncate. Type Cecid. 1053.

Dasyneura ampelophila Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 343

This fuscous yellowish and dark brown species was taken at Albany, N. Y., July 13, 1906 on Virginia creeper, *Pseuderale quinquefolia*.

Male. Length 1 mm. Antennae nearly as long as the body, sparsely haired, dark brown, the basal segments yellowish, the fifth

with a length three-fourths that of the basal enlargement, which latter has a length one-half greater than its diameter; terminal segment narrowly oval. Palpi; first segment rather slender, irregular, the second subrectangular, somewhat stout, the third a little longer, more slender, the fourth one-third longer than the third, somewhat dilated. Mesonotum dark brown, the submedian lines narrow, yellow, sparsely haired. Scutellum and postscutellum dark brown. Abdomen dark sooty yellow, with the dorsum of the second, third and fourth abdominal segments dark brown. Pleurae sooty yellowish; genitalia dark brown. Wings hyaline, costa dark brown. Halteres yellowish white basally and apically, fuscous subapically. Coxae and base of femora pale yellowish, the other parts of the legs nearly uniform dark brown; claws slender, strongly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment stout, long; dorsal plate long, deeply and triangularly incised; ventral plate rather long, tapering, narrowly rounded. Harpes short, thickly spinose apically. Type Cecid. 449.

Dasyneura setosa Felt

1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 115. Separate, p. 19

1908 ——— N. Y. State Mus. Bul. 124, p. 343

This dark brown male was taken on a window at Nassau, N. Y., August 10, 1906.

Male. Length .75 mm. Antennae a little shorter than the body, thickly haired, dark brown; 14 segments, the fifth with a stem about three-fourths the length of the basal enlargement; terminal segment with a distal prolongation one-fourth the length of the subcylindric basal portion. Palpi; the first segment elongate, slender, slightly swollen distally, second suboval, about as long as the first, the third a little longer than the second, the fourth one-half longer than the third; face fuscous. Mesonotum dark brown, submedian lines sparsely haired. Scutellum reddish brown, postscutellum fuscous yellowish brown. Abdomen dark brown, sparsely yellow-haired. Wings hyaline, costa dark brown; halteres yellowish, slightly fuscous apically. Coxae and base of femora yellowish, other portions of legs dark brown; claws slender, strongly curved. Genitalia; basal clasp segment moderately stout; terminal clasp segment stout at base. Dorsal plate broad, deeply incised; ventral plate indistinct. Harpes short, subtriangular. Type Cecid. 750.

Dasyneura unguicula Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 344

This male was taken on a window at Nassau, N. Y., July 15, 1907 and also late in July and in August in 1906.

Male. Length .5 mm. Antennae a little longer than the body, rather thickly haired, dark brown; 14 segments, the fifth with a stem about three-fourths the length of the basal enlargement, which

latter has a length about one-half greater than its diameter; terminal segment produced, narrowly oval. Palpi; the first segment elongate, slender, slightly expanded distally, the second a little longer, stouter, the third as long as the second, more slender, the fourth one-half longer and more slender than the third. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum dark reddish brown with a few coarse setae apically, postscutellum and abdomen dark brown. Wings (pl. 6, fig. 3) hyaline, costa dark brown. Halteres fuscous subapically, whitish apically. Legs a nearly uniform dark brown; claws very long, slender, strongly curved, the pulvilli much shorter than the claws. Genitalia; basal clasp segment long; terminal clasp segment swollen at the base, tapering; dorsal plate long, broad, deeply and triangularly incised; ventral plate long, narrowly rounded. Type Cecid. 1225.

Dasyneura pudorosa Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 344

This species was taken at Nassau, N. Y., June 14, 1906 in general collecting.

Male. Length .75 mm. Antennae probably about as long as the body, thickly fine haired, dark brown; 14 segments, the fifth with a stem about three-fourths the length of the basal enlargement; terminal segment reduced, suboval, narrowly rounded. Palpi; the first segment rather slender, subquadrate, second a little longer, stouter, tapering slightly distally, the third a little longer, more slender, narrowly rounded, the fourth one-half longer and more slender than the third. Mesonotum nearly uniform dark brown. Scutellum dark brown, yellowish apically, postscutellum yellowish brown. Abdomen dark reddish brown, the terminal segments pale yellowish. Genitalia fuscous yellowish. Wings hyaline, costa dark brown; halteres yellowish transparent. Coxae and basal portion of femora whitish or whitish transparent, other parts of legs dark brown; claws long, slender, evenly curved. Genitalia; basal clasp segment long, slender; terminal clasp segment short, stout; dorsal plate broad, deeply and triangularly incised; ventral plate narrow, broadly rounded. Harpes stout, heavily chitinized basally, a series of stout subapical teeth, the terminal portion slender. Type Cecid. 279.

Dasyneura simulator Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 344

This species with a dark brown abdomen was taken on a window at Nassau, N. Y., July 3 and 21, 1906.

Male. Length 1 mm. Antennae nearly as long as the body, thickly haired, dark brown; 14 segments, the fifth with a stem three-fourths the length of the basal enlargement, which latter has a length only one-fourth greater than its diameter and is thickly

clothed with long, stout setae; terminal segment narrowly oval. Palpi; first segment slender, slightly incrassate, the second a little longer, stouter, the third longer than the second, more slender, the fourth a little longer than the third, slightly dilated. Mesonotum dark brown, the narrow submedian lines indistinct. Scutellum dark brown with sparse apical setae, postscutellum yellowish brown. Abdomen with the basal and terminal segments fuscous yellowish, the intermediate ones dark brown. Wings hyaline, vestiture sparse. Halteres orange yellow basally, whitish apically. Coxae pale yellowish, femora pale yellowish basally, fuscous apically; tibiae and tarsi a nearly uniform dark brown; claws slender, strongly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment swollen basally; dorsal plate long, deeply and narrowly incised; ventral plate long, tapering to a narrowly rounded apex. Type Cecid. 445.

***Dasyneura trifolii* Loew**

Clover leaf midge

1874 Loew, F. Vehr. z.-b. Ges. Wien, 24:143

1880 Comstock, J. H. U. S. Comm. of Agric. Rep't, p. 197-99

1881 Lintner, J. A. N. Y. State Agric. Soc. 40th Rep't, p. 24-25

1894 Comstock, J. H. Manual for the Study of Insects, p. 446

1901 Howard, L. O. Insect Book, p. 113

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 344

1909 Folsom, J. W. Ill. Agric. Exp't Sta. Bul. 134, p. 171-75

This European species was first recognized in America by Prof. J. H. Comstock in 1879. White clover was observed in the middle of June to be infested with Cecidomyiid larvae, the affected leaves being closely folded together upon the midrib so that the upper side of each half of the leaflet was apposed, there being from one to twenty whitish or pale orange maggots in the shelter thus formed. The under surface of infested leaves has a sickly appearance, being yellowish or brownish. This species is of comparatively slightly economic importance in this country, since its attacks appear to be confined largely to white clover, *Trifolium repens*, though in Europe it is said to affect the lower root leaves of red clover, *Trifolium pratense*. Doctor Folsom states that he has been unable to find this midge upon red clover in Illinois.

Life history. The following summarized account was taken largely from Doctor Folsom's discussion of this species. The pod-like galls formed by the adherent discolored halves of clover leaflets are common on white clover throughout the growing season, since the species breeds almost continuously during this entire period. Several stages in the development of the insect may be represented at the same time in one gall. Even larvae coming from

eggs laid at the same time do not all develop equally, the more vigorous thriving at the cost of the weaker, the latter frequently perishing from lack of nourishment. Doctor Folsom records June 21st as the earliest date for affected leaves containing larvae and cocoons. The species occurred in Illinois thereafter up to October 5th on which date larvae were common. The latest eggs and larvae are killed by frost, along with the leaves upon which they subsist. It is probable that this insect winters in the cocoon, though Doctor Folsom thinks it may possibly survive in the adult stage. His observations lead him to fix the number of broods at four, with a scattering fifth generation, each requiring about a month on an average for its development. The broods overlap sufficiently to make their separation in the field difficult, though there are times when almost all the galls are empty, indicating an interval between generations. The eggs are deposited by the females in the unfolded leaflets. The process has been described by Doctor Folsom as follows: "Standing at the base of this (young leaflet), she wriggles her long, flexible ovipositor in between the two contiguous faces of the leaflet as far as possible; at intervals a slight wave of distention passes back along the ovipositor, indicating probably the passage of an egg. Usually several eggs are laid on the same leaflet — sometimes a dozen or more. After many eggs are laid, the abdomen of the female is noticeably smaller." The eggs hatch in about six days and the young larvae, instead of folding the leaves as might be supposed, in reality prevent their unfolding. This species, like the clover seed midge, *Dasyneura leguminicola* Lintn., is very sensitive to moisture, contracting and becoming motionless when it is dry and resuming activity with the appearance of moisture. The larva may pupate without making a cocoon or may spin a cocoon as described by Doctor Folsom, the insect remaining in the cocoon from 9 to more than 20 days. Doctor Folsom states that the dorsal bands of black scales are much larger and denser in this species than in *D. leguminicola* and that the scales do not rub off so easily, the abdomen being usually blackish.

Gall. This is simply the unfolded leaves of white clover, *Trifolium repens*, or the root leaves of red clover, *Trifolium pratense*, adhering together and thus resembling small, thin pods. The leaf substance is a little thickened, yellowish or yellow, with brownish specks.

Egg. Length .3 mm, width .075 mm, elliptico-cylindrical, with a slight curvature, colorless and translucent when laid but showing

an internal red spot on the second day and becoming pale orange in color. Several eggs are usually laid side by side. (Folsom)

Larva. The young larva is .27 mm in length, colorless and transparent, and soon becomes white. The full grown larva is 1.5 to 2 mm, long, orange, the skin is coarsely granulate.

Cocoon. Length 1.5 mm, oval, often a little flattened from contact with the leaflet or with other cocoons. (Folsom)

Pupa. Orange in color, with a darker median ventral stripe and blackish eyes. (Comstock)

Male. Length 1.5 mm. Antennae nearly as long as the body, rather thickly haired; 14-16 antennal segments, the fifth with a stem as long as the basal enlargement, which latter has a length one-half greater than its diameter; terminal segment reduced, sometimes broadly fused with the preceding. Palpi; first segment subquadrate, the second a little longer, stout, the third one-half longer than the second, slender, the fourth a little longer than the third. Mesonotum reddish brown, the submedian lines sparsely haired. Scutellum yellowish orange, postscutellum a little darker. Abdomen reddish orange; genitalia reddish brown. Wings (pl. 6, fig. 1) hyaline, costa dark brown, subcosta uniting therewith at the basal third. Halteres yellowish. Coxae and femora basally yellowish, distal portion of femora, tibiae and tarsi dark brown; claws stout, strongly curved, the pulvilli longer than the claws. Genitalia; basal clasp segment stout; terminal clasp segment long, stout; dorsal plate short, broad, deeply and triangularly emarginate, the divergent lobes broadly rounded; ventral plate deeply and roundly emarginate, the lobes narrow. Harpes long, narrow, irregular; style long, slender.

Female. Length 1.5 mm. Antennae extending to the third abdominal segment, sparsely haired, dark brown; 14 or 15 cylindric segments, the fifth with a length twice its diameter; subbasal whorl sparse, subapical band scattering; terminal segment reduced or fused with the preceding. Palpi; first segment short, stout, second broadly oval, the third a little longer, more slender, the fourth longer and more slender than the third. Ovipositor relatively stout and not longer than the body, the terminal lobes with a length four or five times greater than their breadth. Color characters nearly as in the male.

This species occurs in Illinois, Massachusetts and New York. It is probably widely distributed.

Dasyneura cyanococci Felt

1907 Felt, E. P. New species Cecidomyiidae, 2, p. 11-12

1908 ——— N. Y. State Mus. Bul. 124, p. 292-93, 344

This species was reared from an apical bud gall on blueberry, probably *Vaccinium canadense*, taken at Stowe, Mass., September 9, 1907.

Female. Length 1.25 mm. Antennae one-half the length of the body, sparsely haired, dark brown, the basal segment yellowish;

15 sessile segments, the fifth subcylindric, with a length nearly twice its diameter; terminal segment somewhat produced, tapering to an obtuse apex. Palpi; the first segment short, stout, subquadrate, the second about as long, narrowly oval, the third one-half longer than the second, more slender, the fourth a little longer and more slender than the third; face yellowish. Mesonotum dark brown, the submedian lines thickly haired. Scutellum brownish red, postscutellum yellowish red. Abdomen deep brown, the incisures dark reddish, pleurae and venter pale yellowish. Ovipositor fuscous yellowish. Wings hyaline, costa dark brown. Halteres pale yellowish, slightly fuscous apically. Coxae and base of femora pale yellowish, the latter slightly fuscous distally; tibiae and tarsi dark brown; claws long, rather stout, strongly curved, the pulvilli shorter than the claws. Ovipositor about as long as the abdomen, the terminal lobes broad, narrowly rounded apically. Type Cecid. a1700.

***Dasyneura flavescens* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 344

This yellowish species was taken on ash, *Fraxinus*, at Albany, N. Y., July 17, 1906.

Female. Length 1 mm. Antennae extending to the third abdominal segment, sparsely haired, dark brown; 15 segments, the fifth with a length about one-half greater than its diameter, the terminal segment narrowly oval. Palpi; first segment short, stout, the second rectangular, with a length three times its diameter, the third longer, more slender and the fourth one-half longer than the third, more slender. Mesonotum dark brown, the submedian lines yellowish and fusing posteriorly to form a conspicuous yellowish median area. Scutellum pale orange, postscutellum yellowish. Abdomen pale yellowish, the dorsal sclerites with the second and third abdominal segments dark brown and with lateral dark brown markings on the posterior margins of the sclerites of the fourth and fifth segments; ovipositor pale yellowish. Wings hyaline, costa dark brown. Halteres yellowish transparent; coxae, femora and tibiae mostly pale yellowish, tarsi mostly dark brown; claws stout, strongly curved, the pulvilli as long as the claws. Ovipositor nearly as long as the body, the slender, terminal lobes with a length three times the breadth. Type Cecid. 601.

***Dasyneura rhois* Coq.**

1895 **Coquillett, D. W.** Ins. Life, 7:348 (*Cecidomyia*)

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 346

This species does not appear to have been noticed since its discovery in 1895. It was reared by Mr Coquillett from galls on the roots of the common poison ivy sent to him in March 1894 by Mr W. H. Harrison of Lebanon Springs, N. Y. The adults began to issue May 3d and continued up to the 18th of the month.

***Dasyneura clematidis* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 344, 345

1909 ———— Ent. Soc. Ont. 39th Rep't, p. 45.

1910 **Stebbins, F. A.** Springf. Mus. Nat. Hist. Bul. 2, p. 34

This species was reared in August 1907 from an irregular, subglobular gall on Virgins bower, *Clematis virginiana*. The gall was found at Highland, Albany and Newport, N. Y.

Gall. This is an irregular, subglobular, axillary mass 1 cm in diameter and composed of deformed and enlarged rudimentary leaves or young buds; it is green and slightly hoary.

Male. Length 1 mm. Antennae extending to the fifth abdominal segment, thickly haired, dark brown, yellowish basally; 15 segments, the fifth with a stem one-half the length of the basal enlargement, which latter has a length twice its diameter; terminal segment narrowly oval. Palpi scaled; first segment irregularly oval, the second narrowly elliptical, the third a little longer, more slender, the fourth one-half longer than the third. Mesonotum a variable yellowish brown. Scutellum and postscutellum pale yellowish orange. Abdomen pale orange with the dorsal sclerites light reddish brown; genitalia slightly fuscous. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Coxae and base of femora yellowish, the distal portion of femora, tibiae and tarsi mostly dark brown, the tarsi darker; claws strongly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment stout; dorsal plate long, deeply and narrowly incised; ventral plate long, deeply and narrowly divided. Harpes rather long, stout.

Female. Length 1.25 mm. Antennae extending to the base of the abdomen, thickly haired, dark brown, yellowish basally; 16 antennal segments, the fifth with a length one-half greater than its diameter, the terminal segment produced, with a length four times its diameter, the distal third slender, tapering, narrowly rounded. Palpi scaled; the first segment slender, with a length nearly three times its diameter, the second narrowly oval, the third longer than the second, more slender, the fourth nearly twice the length of the third. Mesonotum reddish orange, the submedian lines indistinct. Scutellum and postscutellum pale orange. Abdomen a light fuscous yellowish, the segments sparsely margined with fuscous. Ovipositor nearly as long as the body, the terminal lobes slender, with a length about four times the width. Other characters as in the opposite sex. Type Cecid. a1659.

***Dasyneura smilacifolia* Felt**

1911 **Felt, E. P.** Econom. Ent. Jour., 4:480

This species was reared during the latter part of August and early September 1911 from rolled leaves of *Smilax*, green brier, collected

by Miss Cora H. Clarke at Magnolia, Mass. Similar larvae were obtained three years before, although no midges were reared therefrom.

Larva. Length 2 mm, rather stout, whitish. Head rather broad, the antennae with a length fully three times the diameter and rather stout; breastbone bidentate, the anterior portion deeply chitinized, the shaft slender and semitransparent. Skin coarsely shagreened, each segment with a transverse row of rather long, stout setae near the anterior third; posterior extremity subtruncate and sparsely ornamented with stout setae.

***Dasyneura filicis* Felt**

1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 115-16. Separate, p. 19
1908 ——— N. Y. State Mus. Bul. 124, p. 344.

This species was taken on ferns or wild Cranesbill at Albany, N. Y., May 17, 1906.

Male. Length 1.5 mm. Antennae shorter than the body, dark brown, sparsely haired; 15 segments, the fifth with a stem about two-thirds the length of the cylindric basal enlargement; terminal segment produced, obtusely rounded. Palpi; first segment short, the second and third suboval, twice the length of the second, the fourth one-half longer than the third, slender. Mesonotum yellowish laterally, slaty brown dorsally and with long, dark hairs. Scutellum yellowish, postscutellum yellowish and red. Abdomen yellowish red with a fuscous spot basally. Wings hyaline, costa dark brown. Halteres, coxae, femora and tibiae yellowish transparent, thickly gray haired; tarsi grayish brown; claws stout, strongly curved. Genitalia; basal and terminal clasp segments stout; dorsal plate broad, deeply incised; ventral plate broad, long, roundly emarginate. Harpes broad at base, tapering, irregularly dentate apically. Type Cecid. 43.

***Dasyneura flavicornis* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 345

This species was reared the latter part of July 1907 from a peculiar, greenish or purplish, pouchlike gall occurring on narrow-leaved *Solidago*, *S. graminifolia*, at Albany, N. Y.

Gall. The gall ranges in length from 2.5 to 5 cm, tapering gradually from an enlarged base to a very slender, frequently curved tip. It is composed of two or more leaves, the folded edges of which have become adherent. It varies in color from greenish to purplish and the interior is inhabited by yellow larvae.

Larva. The yellowish larva is about 1.3 mm in length with both ends rounded and the segmentation distinct. One specimen mounted has no distinct breastbone and may not prove to be the larva of this species, hence it is not described in detail.

Female. Length 1.5 mm. Antennae extending to the third abdominal segment, sparsely haired, light fuscous yellowish, tinged with reddish distally; 16 segments, the fifth with a length about one-half greater than its diameter, suboval, the terminal segment not produced and closely fused with the preceding. Palpi; first segment rectangular, the second broader, the third longer than the second, slender, the fourth one-half longer than the third, more slender. Face yellowish. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum reddish orange, postscutellum a little darker. Abdomen sparsely haired, dark brown, the incisures a deep carmine, pleurae mostly yellowish, ovipositor fuscous yellowish. Wings hyaline, costa dark brown. Halteres yellowish basally, light fuscous apically. Coxae and base of femora light yellowish, the distal portion of femora, tibiae and tarsi a nearly uniform dark fuscous straw; claws long, stout, evenly curved, unidentate, the pulvilli longer than the claws. Ovipositor about as long as the abdomen, the terminal lobes with a length three times the width, narrowly rounded. Type Cecid. a1154.

***Dasyneura maritima* Felt**

1909 Felt, E. P. Econom. Ent. Jour., 2:288

The pale whitish larvae of this species were found October 7, 1908 in tightly rolled terminal leaflets of the beach-pea, *Lathyrus maritimus*, by Miss Cora H. Clarke at Magnolia, Mass. Adults were reared April 13 and 15, 1909.

Gall. The galls or rolled leaves are about 1 to 2 cm long, .2 cm in diameter and a variable yellowish green. They are inhabited by several larvae.

Larva. Length 3 mm, pale whitish, rather stout, tapering at both extremities. Head small, antennae long, slender. Breastbone bidentate, weakly chitinized, the shaft subobsolete. Skin coarsely shagreened. Posterior extremity broadly rounded, slightly bilobed.

Male. Length 1.75 mm. Antennae nearly as long as the body, thickly haired, dark brown; 18 segments, the fifth with a stem three-quarters the length of the basal enlargement, which latter has a length one-half greater than its diameter; subbasal whorl thick, subapical band very thick; terminal segment reduced, narrowly oval. Palpi; the first segment presumably subquadrate, the second with a length over three times its diameter, the third one-third longer and the fourth one-half longer than the third. Mesonotum shining black, the submedian lines sparsely haired. Scutellum yellowish, fuscous apically, postscutellum fuscous. Abdomen sparsely haired, dark brown, the sclerites and venter pale yellowish. Genitalia fus-

cous. Wings hyaline, costa dark brown. Halteres pale yellowish. Coxae and femora basally fuscous yellowish, the distal portion of femora and tibiae dark brown, the tarsi nearly black; claws slender, strongly curved, the pulvilli longer than the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment stout; dorsal plate broad, broadly and roundly emarginate; ventral plate broadly and roundly emarginate. Harpes stout, tapering, irregular apically.

Female. Length 2 mm. Antennae extending to the base of the abdomen, sparsely haired, dark brown, yellowish basally; 16-17 sessile segments, the fifth cylindric, with a length about twice its diameter; terminal segment produced, tapering to a narrowly rounded apex. Palpi; probably as in the male. Face fuscous yellowish. Mesonotum yellowish brown, the submedian lines rather thickly haired. Scutellum yellowish orange, postscutellum a little darker. Abdomen sparsely clothed with short, yellowish hairs, dark brown, the incisures, pleurae and venter reddish orange, the extremities of the abdomen and ovipositor yellowish. Ovipositor nearly as long as the body; terminal lobes with a length about three times the diameter, narrowly oval. Type Cecid. a1895.

***Dasyneura eugeniae* Felt**

1912 **Felt, E. P.** N. Y. Ent. Soc. Jour., 20:106

The midges were reared from the fruit of *Eugenia buxifolia* collected at Key West, Fla., by E. A. Schwarz.

***Dasyneura vaccinii* Smith**

1890 **Smith, J. B.** N. J. Agric. Exp't Sta. Bul. K., p. 31-37 (*Cecidomyia vaccinii* O. S.)

1890 ——— Cat. Ins. N. J., p. 369 (*Cecidomyia vaccinii* O. S.)

1892 **Fernald, C. H.** Mass. Agric. Exp't Sta. Bul. 19, p. 134-35 (*Cecidomyia vaccinii* O. S.)

1899 **Johnson, C. W.** Ent. News, 10:80 (*C. oxycoccana* proposed)

1900 ——— Ent. News, 11:324 (*Cecidomyia oxycoccana*)

1908 **Beutenmueller, William.** Amer. Mus. Nat. Hist. Bul. 23, p. 392 (*Cecidomyia vaccinii* O. S.)

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 345

1910 **Stebbins, F. A.** Springf. Mus. Nat. Hist. Bul. 2, p. 46 (*Cecidomyia*)

This species is known to the cranberry grower as the tip worm. The first sign of its presence, according to Doctor Smith, is the unusual prominence of certain terminal buds accompanied by a cessation in the growth of the leaves. An examination discloses the yellowish *Cecidomyiid* larvae within the affected bud. The tip usually though not always dies. This midge causes considerable injury to cranberry beds.

Dr J. B. Smith, who has investigated the life history of this species, states that there are at least four and probably five generations annually, the insects occurring at any time from the beginning of May to the middle or end of September, the larva requiring about 13 days to complete its growth. The egg has not been observed nor is there any record as to the method of hibernation, though it is probable that this species, like many of its allies, winters in an oval, larval cell in the soil. The transformation of the larva to the adult during the warm season at least, occurs within the buds, the larva spinning a white cocoon prior to pupation. The reddish brown adult, with its curved third vein, may be recognized by the 16 antennal segments, the fifth of the male having a stem as long as the basal enlargement, while that of the female has a length twice its diameter.

Synonymy. This species was first described by Doctor Smith under the name of *Cecidomyia vaccinii*, which designation, we believe, must stand, since Osten Sacken's *vaccinii* was not applied to an insect but to a vegetable deformation and therefore has no standing in zoological nomenclature. This obviously renders it impossible to accept Professor Johnson's proposed *Cecidomyia oxycoccana* for the species described by Doctor Smith. There are two European Cecidomyiidae to which the specific name of *vaccinii* has been applied; one *Dasyneura vaccinii* described by Rubsaamen in 1885 and the other *Cecidomyia vaccinii* described by Kieffer in 1897. The application of this specific name to our American species antedates both of these and should it prove co-generic with either, the name of the European form must be changed.

Larva. The larva has been described by Doctor Smith as a minute, orange, red or yellow grub about .06 of an inch or a trifle more in length.

The following descriptions of adults have been drafted from specimens evidently deposited by Doctor Smith in the United States National Museum.

Male. Length 1 mm. Antennae a little longer than the body, thickly haired, fuscous yellowish; 16 segments, the fifth with a stem about as long as the basal enlargement, which latter has a length about one-half greater than its diameter; terminal segment somewhat produced, broadly rounded distally. Palpi; the first segment short, stout, irregularly subquadrate, the second a little longer, stout, broadly oval, the third one-half longer, more slender, the fourth about as long as the third, more slender. Mesonotum reddish brown, the submedian lines probably indistinct. Scutellum fuscous yellowish, postscutellum a little darker. Abdomen reddish

brown. Wings hyaline, costa light brown. Halteres yellowish brown, slightly fuscous apically. Legs yellowish brown, the tarsal segments somewhat darker; claws rather long, slender, strongly curved, the pulvilli distinctly longer than the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment stout; dorsal plate short, broad, deeply and triangularly incised, the lobes widely separated, narrowly rounded; ventral plate long, broad, deeply and roundly emarginate, the lobes long, slender, obtuse. Harpes stout at base, tapering, irregularly tuberculate.

Female. Length 3 mm. Antennae extending to the fourth abdominal segment, thickly haired, light brown; 16 segments, the fifth with a stem about one-sixth the length of the basal enlargement, which latter has a length about twice its diameter; terminal segment somewhat produced, narrowly rounded apically. Palpi; the first segment short, stout, irregularly subquadrate, the second a little longer, narrowly oval, the third one-half longer than the second, more slender, the fourth one-half longer than the third, more slender. Color characters about as in the male, except that the abdomen is somewhat lighter. Ovipositor nearly as long as the body, the terminal lobes long, rather broad, tapering, narrowly rounded. Type Cecid. 957.

Dasyneura modesta Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 345

A female of this form was observed in the vicinity of red oak at Albany, N. Y., May 19, 1907.

Female. Length 1.75 mm. Antennae extending to the third abdominal segment, sparsely haired, dark brown, the basal segments yellowish; 16 segments, the fifth subsessile, subcylindric; terminal segment produced, narrowly rounded distally. Palpi; the first segment irregularly subquadrate, somewhat dilated apically, the second one-half longer, tapering distally, the third twice the length of the second, more slender, the fourth one-half longer than the third, face fuscous. Mesonotum dark brown, sparsely bordered laterally and anteriorly with golden yellow scales, the submedian lines thickly set with yellowish scales. Scutellum deep red, postscutellum fuscous red. Abdomen sparsely clothed with fine hairs, light brown, the incisures and venter a pale salmon. Wings hyaline, costa light brown. Halteres pale salmon basally, yellowish transparent apically. Legs a variable light fuscous, the distal tarsal segments darker; claws long, slender, strongly curved, the pulvilli as long as the claws. Ovipositor about as long as the body, terminal lobe long, slender, narrowly rounded. Type Cecid. 1200.

Dasyneura apicata Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 345 (*D. apicatus*)

This pale yellow species was reared September 7, 1907, from a deformed, terminal growth on ash, *Fraxinus*, shoots taken at Highland, N. Y., August 22, 1907.

Gall. This species was reared from ash shoots, the young terminal leaves forming a head and two petioles often coalescing to produce a hoary, pubescent gall containing whitish larvae some 2 mm long.

Larva. Length 2 mm, whitish, rather stout; head broad, obtuse apically. Antennae rather stout, uniarticulate; breast-bone bidentate, subobsolete posteriorly. Skin nearly smooth, posterior extremity broadly rounded, the latero-posterior angles with three or four slender spines arising from more or less distinct tubercles.

Female. Length 1.25 mm. Antennae one-half the length of the body, sparsely haired, fuscous yellowish, yellowish basally; 16 sessile segments, the fifth with a length one-half greater than its diameter, the terminal segment produced, narrowly oval. Palpi scaled; the first segment short, subquadrate, the second broadly oval, the third a little longer and more slender, the fourth nearly twice the length of the third. Mesonotum pale yellowish, slightly fuscous, the submedian lines indistinct. Scutellum, postscutellum and abdomen pale yellowish, the latter slightly fuscous dorsally; pleurae pale yellowish. Wings hyaline, costa brown. Halteres pale yellowish. Coxae and femora basally yellowish, the distal part of femora and tibiae fuscous yellowish, tarsi dark brown or black. Ovipositor longer than the abdomen, the slender terminal lobes with a length fully four times the width. Type Cecid. a1712.

Dasyneura caricis Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 116. Separate, p. 19-20

1908 ——— N. Y. State Mus. Bul. 124, p. 345

This species was taken June 4, 1906 on sedge, *Carex vulpinoidea*, at Albany, N. Y.

Male. Length 1 mm. Antennae longer than the body, thickly haired, light brown; 16 segments, the fifth with a stem one-quarter longer than the basal enlargement; terminal segment irregularly suboval, the apex obtusely rounded. Palpi; the first segment short, subquadrate, the second fully twice the length of the first, with a distinct lateral knob, the third as long as the second, subrectangular, the fourth nearly twice the length of the third, slender, the fifth one-quarter longer than the fourth, flattened, slender; face light brown. Mesonotum dark brown with narrow, submedian lines of fine setae. Scutellum reddish brown with sparse apical setae, postscutellum yellowish. Abdomen yellowish brown, rather sparsely clothed with yellowish hairs, tip of genitalia dark brown. Wings hyaline, costa thickly clothed with blackish hairs; halteres yellowish transparent basally, yellowish fuscous apically. Legs nearly uniform light brown; tarsi slightly darker; claws rather slender, uniformly curved. Genitalia; basal clasp segment slender, internally with a broadly rounded lobe at the basal third; terminal clasp segment with the basal third greatly swollen; dorsal plate broad, deeply incised; ventral plate broad at

base, narrowing at the basal third, deeply and triangularly emarginate. Harpes stout, subtriangular, apically several inconspicuous subquadrate teeth.

Female. Length 1 mm. Antennae probably a little shorter than the body, sparsely haired, dark brown; probably 16 segments, the fifth with a stem about one-quarter the length of the basal enlargement. Palpi; the first segment short, irregularly subquadrate, the second a little longer, subquadrate, the third more than twice the length of the second, the fourth one-quarter longer than the third, more slender; face dark brown. Mesonotum dark brown, posterior median area reddish. Scutellum yellowish red, postscutellum darker. Abdomen yellowish red. Wings hyaline, costa yellowish brown; halteres and legs yellowish transparent, the latter with the articulations and tarsi variably tinged with carmine. Ovipositor longer than the body, terminal lobe long, narrow, broadly rounded distally. Type Cecid. III.

Dasyneura quercina Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 116. Separate, p. 20

1908 ——— N. Y. State Mus. Bul. 124, p. 345

This dark brown male was taken on oak, probably red oak, *Quercus rubra*, at Albany, N. Y., May 18, 1906.

Male. Length 1.5 mm. Antennae nearly as long as the body, sparsely haired, dark brown; 16 segments, the fifth with a stem about two-thirds the length of the basal enlargement; terminal segment produced, constricted near the middle. Palpi; the first segment subquadrate, the second one-half longer than the first, the third more slender, one-half longer than the second and the fourth one-half longer than the third. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum reddish brown, postscutellum darker. Abdomen dark brown, sparsely haired, reddish laterally. Wings hyaline, costa yellowish brown. Halteres yellowish transparent basally, reddish fuscous apically. Legs light brown, tarsi slightly darker; claws slender, strongly curved. Genitalia; basal clasp segment slender; terminal clasp segment slightly enlarged basally; dorsal plate broad; ventral plate narrow; both deeply and triangularly incised (pl. 7, fig. 1). Harpes broad, convolute, broadly rounded, indistinctly dentate. Type Cecid. 47.

Dasyneura lepidii Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 346

This reddish brown species was reared in early July from seed capsules of *Lepidium virginicum* taken at Washington, D. C., July 7, 1899 by Mr Pergande. Several Chalcids were reared the middle of July.

Gall. The gall of this species, as described by Pergande, consists of peculiarly swollen or inflated seed capsules having an abnormally dark green color.

Female. Length 1.25 mm. Antennae about three-quarters the length of the body, sparsely haired, dark brown; 17 segments, the fifth with a length one-quarter greater than its diameter; terminal segment slightly produced, narrowly oval. Palpi; the first segment subquadrate, the second rectangular, with a length three times its diameter, the third longer, more slender, the fourth a little longer and more slender than the third. Mesonotum shining dark brown. Scutellum fuscous yellowish, postscutellum a little darker. Abdomen reddish brown (dark red according to Pergande). Wings hyaline, costa reddish brown. Halteres yellowish transparent. Legs mostly yellowish brown, the distal tarsal segments darker; claws strongly curved, the pulvilli longer than the claws. Ovipositor about two-thirds the length of the abdomen, the terminal lobes short and broad. Type Cecid. 1035.

Dasyneura smilacinae Bish.

1911 Bishop, S. C. Ent. News, 22:346

The above named midge was reared by Mr S. C. Bishop at Ithaca, N. Y., January 15, 1910 from root galls on false Solomon seal, *Smilacina racemosa*. See the above citation for a detailed description.

Dasyneura tumidosae Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 346

This species was reared in small numbers in July 1907 from a jar containing numerous galls generally referred to as *Cecidomyia pellex* O. S.

Gall. A large, tumid, green, reddish or brownish midrib swelling ranging in length from 5 to 15 cm (pl. 2, fig. 4), the larger deformities containing from 30 to even 60 or more larvae irregularly distributed along the length of the deep fold evidently caused by their operations.

Male. Length 1.5 mm. Antennae nearly as long as the body, rather thickly haired, fuscous yellowish, the basal segments yellowish; 17 segments, the fifth with a stem about one-half the length of the basal enlargement; terminal segment somewhat reduced, obtusely obconic. Palpi; the first segment short, stout, subquadrate, expanded distally, the second one-half longer than the first, stout, rounded distally, the third one-half longer and more slender than the second, the fourth more slender and about twice as long as the third; face yellowish. Mesonotum dark brown, the broad submedian yellowish lines sparsely haired. Scutellum reddish brown, postscutellum pale orange. Abdomen pale yellowish, slightly fuscous. Genitalia fuscous. Wings hyaline, costa dark brown. Halteres yellowish transparent, slightly fuscous subapically. Legs mostly pale yellowish, the two basal tarsal segments light fuscous,

the three distal ones dark brown or black; claws long, slender, strongly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment long, tapering; dorsal plate short, broad, the lobes broadly and triangularly divided; ventral plate long, broad at base, tapering, broadly and roundly emarginate. Harpes long, stout at base, tapering, obtuse.

Female. Length 1 mm. Antennae extending to the second abdominal segment, thickly long-haired, dark brown, basal segments yellowish; 19 segments, the fifth cylindric, with a length about two and one-half times its diameter; terminal segment produced, with a length about four times its diameter, narrowly rounded apically. Palpi; the first segment short, stout, subquadrate, the second broadly oval, with a length over twice its diameter, the third one-half longer and more slender than the second, the fourth one-half longer and more slender than the third; face yellowish. Mesonotum a light fuscous orange, the submedian lines sparsely haired. Scutellum, postscutellum and pleurae deep orange. Abdomen a light fuscous yellowish, the venter yellowish. Wings hyaline, costa dark brown. Halteres pale orange; coxae and femora mostly pale orange, the latter narrowly or slightly marked with fuscous apically; tibiae fuscous orange, tarsi mostly dark brown, the basal segments somewhat lighter; the pulvilli as long as the claws. Ovipositor nearly as long as the body, the terminal lobes stout, with a length over four times the diameter, narrowly rounded. Type Cacid. a1532.

***Dasyneura pergandei* Felt**

1911 **Felt, E. P.** Econom. Ent. Jour., 4:480

This species was reared by Mr Theodore Pergande in 1878 from swollen fruit of wild cherry, probably *Prunus melanocarpa*, collected by Prof. C. V. Riley at Glen Eyrie, Col., the preceding June. The reddish larvae deserted the infested fruit, wintering in the ground. Mr Pergande's rearings paralleled those of the writer, in that he secured more than one species, as is evidenced by a study of the specimens reared.

Gall. Somewhat oval, pointed at the end, the upper half reddish, the other yellowish green (Pergande).

***Dasyneura multiannulata* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 346

This species was taken on hickory, *Carya*, at Nassau, N. Y., June 14, 1906.

Female. Length 1 mm. Antennae extending to the second abdominal segment, sparsely clothed with fine setae, reddish brown, yellowish white basally; 18 segments, the fifth subsessile, subcylin-

dric, the basal portion having a length fully one-half greater than its diameter, terminal segment somewhat prolonged, apparently consisting of two closely fused and fully twice the length of the preceding. Palpi; the first segment subquadrate, second narrowly oval, the third one-quarter longer than the second, stouter, the fourth a little longer than the third, more slender, face dark yellowish. Mesonotum brownish black, the anterior portion rather thickly clothed with fine setae, submedian lines rather distinct. Scutellum dull black, thickly clothed anteriorly with a patch of yellowish white scales, postscutellum reddish brown. Abdomen pale reddish brown. Wings hyaline, costa yellowish brown; halteres whitish transparent. Legs a nearly uniform pale straw color, tarsi slightly darker; claws long, rather strongly curved. Ovipositor as long as the body, terminal lobes long, slender, broadly rounded. Type Cecid. 261.

***Dasyneura florida* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 346

One female kindly placed at our disposal by the United States National Museum was reared April 27, 1887 from leaves collected by Mr E. A. Schwarz at Keywest, Fla., possibly oak-bearing galls similar to though much smaller than those made by *Cincticornia pilulae* O. S.

Female. Length 1.25 mm. Antennae extending to the base of the abdomen, sparsely haired, light brown; 18 segments, the fifth sessile, cylindric, with a length a little greater than its diameter; terminal segment produced, tapering, narrowly rounded. Palpi; the first segment somewhat expanded distally and with a length nearly three times its diameter, the second nearly as long as the first, rather stout, the third a little longer and more slender than the second and the fourth one-quarter longer and more slender than the third. Mesonotum light brown, the submedian lines rather thickly clothed with fine hairs. Scutellum and postscutellum yellowish brown. Abdomen a nearly uniform dark reddish brown, the basal segment and ovipositor mostly light yellowish brown. Wings hyaline, costa dark brown; halteres pale yellowish. Coxae and femora mostly yellowish brown, the tibiae mostly a little darker, apically dark brown, the tarsi a nearly uniform dark brown; claws rather long, stout, evenly curved, the pulvilli a little shorter than the claws. Ovipositor about one-half the length of the abdomen, the terminal lobes very short, broad, having a length only about three-quarters the diameter. Type Cecid. 1057.

***Dasyneura aberrata* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 346

This male was taken in association with the female described as *Dasyneura modesta* and at first supposed to be the opposite sex of this species. There are, however, striking differences

between the two, and it has therefore been characterized as a distinct form. It was captured May 19, 1907 in the vicinity of red oak at Albany, N. Y.

Male. Length 1.25 mm. Antennae about two-thirds the length of the body, sparsely haired, dark brown; 11 segments, the fifth with a length one-half greater than its diameter; terminal segment somewhat produced, narrowly rounded. Palpi; first segment stout, ovoid, second segment slender, narrowly oval, the third a little longer, more slender, the fourth a little longer than the third, somewhat dilated. Mesonotum dark brown, sparsely bordered laterally and anteriorly with yellowish scales, the submedian lines thickly ornamented with yellowish scales. Scutellum deep red, post-scutellum fuscous red. Abdomen sparsely clothed with fine hairs, light brown, the incisures and venter pale salmon. Wings hyaline, costa pale straw, subcosta uniting therewith at the basal third. Halteres pale salmon basally, yellowish transparent apically. Legs a variable light fuscous, the distal tarsal segments somewhat darker; claws rather slender, strongly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment stout; terminal clasp segment stout at the base, short; dorsal plate short, deeply and narrowly incised; ventral plate short, broad, tapering broadly and roundly emarginate. Harpes long, irregularly truncate. Type Cecid. 1200a.

***Dasyneura cirsoni* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 346

This fuscous yellowish female was taken on Canada thistle, *Cirsium arvense*, at Albany, N. Y., July 17, 1906.

Female. Length .75 mm. Antennae extending to the base of the abdomen, sparsely haired, dark brown; 12 segments, the fifth subcylindric, with a length about one-half greater than the diameter; terminal segment somewhat prolonged, broadly rounded. Palpi; the first segment short, subquadrate, the second short, narrowly oval, the third one-half longer, more slender, the fourth a little longer and more slender. Mesonotum dark brown, submedian lines narrow, yellowish. Scutellum and postscutellum reddish brown. Abdomen fuscous yellowish, pleurae pale yellowish, ovipositor orange yellow. Wings hyaline, costa thickly clothed with dark brown scales; halteres yellowish basally, slightly fuscous apically. Coxae and femora basally semitransparent; the latter distally, tibiae and tarsi mostly dark brown; claws long, slender, evenly curved. Ovipositor as long as the body; the terminal lobes long, slender, narrowly rounded. Type Cecid. 619.

***Dasyneura scutata* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 346

The dark brown female was taken at Albany, N. Y., July 16, 1906 in general collecting on goldenrod and aster.

Female. Length 1 mm. Antennae extending to the base of the abdomen, sparsely haired, dark brown; 13 segments, the fifth subsessile; terminal segment with a length twice that of the preceding, tapering and obliquely rounded. Palpi; first segment irregular, rectangular, the second about as long as the first, narrowly oval, the third a little longer, the fourth more slender and a little shorter. Mesonotum nearly black, submedian lines sparsely setose. Scutellum nearly black, sparsely setose apically, postscutellum and abdomen dark brown, the latter sparsely clothed with silvery setae. Wings hyaline, costa dark brown. Halteres pale yellowish, basally fuscous. Legs dark brown; claws stout, slightly curved. Ovipositor nearly as long as the body, the terminal lobes slender, narrowly rounded. Type Cecid. 507.

Dasyneura acerifolia Felt

1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 115. Separate, p. 18-19

The light brown male was taken on maple at Albany, N. Y., May 21, 1906.

Male. Length .75 mm. Antennae extending to the base of the abdomen, sparsely haired, light brown; 14 segments, the fifth with a stem one-quarter the length of the basal enlargement; terminal segment produced, broadly rounded apically. Palpi; the first segment swollen at the distal third, the second a little longer, suboval, the third slightly longer than the second, more slender, and the fourth one-quarter longer than the third, slender. Mesonotum and scutellum dark brown. Abdomen brown. Wings hyaline, costa light brown. Halteres yellowish transparent. Legs mostly yellowish transparent, variably dark brown distally; claws slender, slightly curved. Genitalia; basal clasp segment long, stout; terminal clasp segment swollen basally; dorsal plate deeply and triangularly emarginate; ventral plate narrow, deeply emarginate. Harpes subtriangular, obtuse.

Female. Length .75 mm. Antennae extending to the third abdominal segment, sparsely haired, dark brown; 13 segments, the fifth subsessile. Face dark brown; eyes large, black. Mesonotum dark brown, the submedian lines dark haired. Scutellum reddish brown, postscutellum yellowish. Abdomen dark brown. Wings hyaline, costa light brown. Ovipositor nearly as long as the body, the terminal lobes slender, acutely rounded. Type Cecid. 66.

Dasyneura albohirta Felt

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 346

This light brown species was taken on fern or cranesbill, *Geranium maculatum*, at Albany, N. Y., May 17, 1906.

Female. Length 1.35 cm. Antennae extending to the third abdominal segment, rather sparsely haired, dark brown; 13 segments, the fifth with a length one-half greater than its diameter, the twelfth and thirteenth closely fused, the latter nearly twice the length of

the normal segment, narrowly rounded apically. Palpi; first segment irregular, somewhat produced, the second narrowly oval, the third one-half longer, more slender, the fourth as long as the third, slightly expanded. Mesonotum very dark brown, the submedian lines thickly haired. Scutellum and postscutellum dark brown, the former with dark fuscous hairs apically. Abdomen light brown, sparsely clothed with white hairs. Wings hyaline, costa dark brown. Halteres yellowish white. Legs dark brown; claws strongly curved, pulvilli distinctly longer than the claws. Ovipositor nearly as long as the abdomen, the terminal lobes slender, with a length three times the width. Type Cecid. 44.

***Dasyneura similis* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 346

This reddish brown species was taken on thistle at Albany, N. Y., July 17, 1906.

Female. Length 2 mm. Antennae extending to the base of the abdomen, sparsely haired, dark brown, yellowish basally; 13 segments, the fifth with a length twice its diameter, the terminal segment greatly produced, evidently composed of two closely fused. Palpi; first segment slender, rectangular, the second a little longer, stouter, the third one-half longer than the second, the fourth a little longer and more slender than the third. Face yellowish. Mesonotum dark brown, the submedian lines yellowish, thickly haired. Scutellum brown, postscutellum darker. Abdomen reddish brown, the dorsal sclerites fuscous. Wings hyaline, costa dark brown. Halteres yellowish transparent. Legs a nearly uniform dark brown; claws strongly curved, the pulvilli longer than the claws. Ovipositor when extended as long as the body; terminal lobes narrowly oval. Type Cecid. 596.

***Dasyneura antennata* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 347

This dark brown species was taken on sugar maple at Albany, N. Y., June 11, 1906.

Female. Length .75 mm. Antennae dark brown, about three-quarters the length of the body, sparsely haired; 13 ovate segments, the fifth with a length one-half greater than its diameter, the terminal segment greatly produced, with a length four times its diameter, evidently composed of two segments closely fused. Palpi; first segment long, slender, second stout, irregularly curved, the third rectangular or ovate, the fourth more than twice the length of the third. Face dark brown. Mesonotum very dark brown. Scutellum reddish brown, postscutellum and abdomen dark brown, the latter sparsely ornamented with fine setae. Wings hyaline, costa dark brown. Halteres yellowish transparent. Legs a nearly

uniform fuscous brown; claws strongly curved, the pulvilli longer than the claws. Ovipositor nearly the length of the abdomen, the terminal lobes slender, with a length nearly four times the width. Type Cecid, 213.



Fig. 19 Gall of *Dasyneura parthenocissi* (natural size, original)

***Dasyneura parthenocissi* Stebb.**

This species produces the rather common turgid midrib swelling (plate 2, figure 13) on the Virginia creeper and has been noticed by the author in detail in the *Journal of the New York Entomological Society*, 21:216-17, 1913.

Dasyneura canadensis Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 157

1908 ——— N. Y. State Mus. Bul. 124, p. 347, 350

This pale salmon midge was reared by the late Dr James Fletcher May 1, 1907 from Cecidomyiid larvae infesting the seeds of white spruce, *Picea canadensis*, taken in the vicinity of Ottawa, Canada. The larvae live within the seeds, and do not produce a deformity in the cone. This species might become of some economic importance on account of destroying spruce seed, though Doctor Fletcher informed us that it was much parasitized by a Proctotrypid and sparsely by a Chalcid. *Microdus bicolor* Prov.? (Ins. Life 3:18) may be a parasite of this midge. *Polygnotus* species was reared from this species.

Male. Length 2 mm. Antennae nearly as long as the body, sparsely haired dark brown, yellowish basally, a few of the terminal segments reddish; mouthparts fuscous yellowish; 17 segments, the fifth with a stem as long as the basal enlargement; terminal segment with the basal portion produced, narrowly oval. Palpi; the first segment subrectangular, the second a little longer, stouter, the third one-half longer and more slender than the second, the fourth a little longer and more slender than the third. Mesonotum reddish brown, sometimes darker, the submedian lines narrow, rather thickly clothed with fine hairs. Scutellum pale yellowish red with a few coarse setae apically, postscutellum and abdomen a pale salmon, the latter sparsely clothed with fine hairs; genitalia fuscous; venter a pale yellowish orange, the subquadrate sclerites dark brown. Wings hyaline, costa dark brown; halteres and basal portion of femora pale yellowish, distal portion of femora and tibiae fuscous yellowish, the tarsi a variable fuscous brown; claws short, stout, strongly curved, the pulvilli longer than the claws. Genitalia; basal clasp segment stout; terminal clasp segment stout at base; dorsal plate broad, deeply and triangularly emarginate; ventral plate long, tapering slightly, broadly and roundly emarginate.

Female. Length 2 mm. Antennae extending to the third abdominal segment, sparsely haired, dark brown, slightly reddish distally, the basal segments fuscous yellowish; 13 segments, the fifth subsessile, subcylindric, tapering, with a length about twice its diameter. Mesonotum a shining brownish black, submedian lines narrow, thickly haired. Scutellum fuscous yellowish with a few coarse setae apically, postscutellum brownish black. Abdomen a pale salmon; ovipositor somewhat lighter. Ovipositor about as long as the abdomen, terminal lobes long, slender, broadly rounded. Other characters about as in the male. Type Cecid. a1428.

***Dasyneura gleditschiae* O. S.**

- 1867 **Osten Sacken, C. R.** Ent. Soc. Phila. Proc., 6:219-20 (Cecidomyia)
 1892 **Beutenmueller, William.** Amer. Mus. of Nat. Hist. Bul., 4:266 (Cecidomyia)
 1900 **Smith, J. B.** Ins. N. J. Cat., p. 620 (Cecidomyia)
 1904 **Cook, M. T.** Ohio St. Univ. Bul. 15, s. 6, p. 267 (Cecidomyia)
 1903 ———— Ohio St. Univ. Bul. 20, s. 7, p. 426-27 (Cecidomyia)
 1904 **Beutenmueller, William.** Amer. Mus. Jour. Guide Leaflet 16, p. 26 (Cecidomyia)
 1905 **Cook, M. T.** Geol. & Nat. Resour. Ind. 29th Rep't, p. 839 (Cecidomyia)
 1906 **Felt, E. P.** N. Y. State Mus. Bul. 104, p. 125 (Cecidomyia)
 1906 ———— N. Y. State Mus. Mem. 8, 2:729 (Cecidomyia)
 1908 ———— N. Y. State Mus. Bul. 124, p. 337, 347.

This species was first observed by Osten Sacken in August 1866 on account of its deforming the leaflets of the honey locust, *Gleditschia triacanthos*. The young leaves are transformed into characteristic podlike swellings inhabited by two or three pale orange larvae. Osten Sacken states that the adults began to appear about the 10th of August. This species is evidently widely distributed, since it has been recorded by Beutenmueller as not common in Central Park, though Doctor Smith lists it as a common form in New Jersey. It is recorded by Cook in his List of Insect Galls of Indiana, as a common species. This species was also reared by B. H. Walden June 20, 1904 from rolled leaves collected at New Haven, Conn. Beutenmueller reports the appearance of the adult in July and August. These records clearly show that the emergence of the flies extends over a considerable period.

Gall. The gall of this species is composed of a folded leaflet deformed in such a way as to assume the appearance of a pod (pl. 8, fig. 4), each gall containing 2 to 3 pale orange larvae with a very delicate, narrow breastbone. Doctor Cook states that the two halves of the leaflet never have an opportunity to unfold though there is a growth of cells allowing the leaflet to enlarge and form the larval chamber between the two halves. The cells are at first normal but gradually lengthen in an axis at right angles to the midrib.

***Dasyneura pseudacaciae* Fitch**

- 1859 **Fitch, Asa.** N. Y. S. Agric. Soc. Trans., 18:833 (Cecidomyia)
 1859 ———— Nox. & Other Ins. N. Y. 5th Rep't, p. 53 (Cecidomyia)
 1874 **Glover, Townend** MSS. Notes from My Journal Dipt., p. 68 (Cecidomyia)
 1890 **Packard, A. S.** U. S. Ent. Com. 5th Rep't, p. 368 (Cecidomyia)
 1906 **Felt, E. P.** Inj. & Other Ins. N. Y. 21st Rep't, p. 125-27
 1906 ———— Ins. Affect. Pk. & Wldd. Trees, N. Y. State Mus. Mem.

This species occasionally occurs on black locust, *Robinia pseudoacacia*, in such numbers as to badly deform the young leaves, preventing their unfolding and causing them to assume a peculiar, podlike form. This is caused by the female depositing probably two or three eggs in each unfolding leaf. The young maggots cause sufficient irritation to prevent the leaf unfolding. It is occasionally so abundant as to affect most of the leaves on an entire hedge, as reported by Mr C. L. Williams of Glens Falls, N. Y., in 1905. The adults appear in July. It is probable that this species has been confused with the described *D. gleditschiae* O.S., which produces similar galls on the honeylocust. This dark brown species with the third vein nearly straight and 14 sessile segments, may be separated from the allied *D. gleditschiae* O.S. by the fifth tarsal segment having a length three times its width and by the long ovipositor lobes, the latter tapering and with a length three times their width.

Gall. The gall of this species simply consists of badly deformed, rolled leaflets forming peculiar, podlike structures about one-quarter of an inch long. Occasionally the insect is so abundant as to deform most of the young leaflets.

Pupa. Length 1.6 mm, brownish; cephalic horns long, slender. The antennal cases extend to the base of the wing pads, the latter to the tip of the second abdominal segment, the leg cases to the third and fourth abdominal segments; eyes dark brown.

Dasyneura californica Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 347

This reddish brown species was reared February 13, 1886 by Mr Pergande from bud galls on willow, *Salix californica*, taken at Alameda, Cal. One parasite was also reared.

Gall. This has been described simply as a bud gall and the larvae inhabiting the same as pale orange.

Female. Length 1 mm. Antennae extending to the fourth abdominal segment, sparsely haired, reddish brown; 14 segments, the fifth with a length one-half greater than its diameter, the fourteenth evidently composed of two closely fused, the distal portion being subconic and separated from the larger basal part by a distinct constriction. Palpi; first segment irregularly subquadrate, the second longer, stouter, the third one-half longer and more slender than the second, the fourth a little longer and more slender than the third. Mesonotum reddish brown, the submedian lines indistinct. Scutellum a little darker, postscutellum yellowish. Abdomen reddish brown, sparsely haired. Wings hyaline, costa light brown. Halteres pale yellowish; coxae and base of femora yellowish, distal part of femora, tibiae and probably tarsi darker; claws strongly

curved, unidentate, the pulvilli longer than the claws. Ovipositor about as long as the body, the terminal lobes with a length three times the diameter. Type Cecid. 981.

***Dasyneura denticulata* Felt**

1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 117. Separate, p. 21

1908 ——— N. Y. State Mus. Bul. 124, p. 347

This peculiar female with very hairy wings and dark carmine abdomen was taken on white spruce, *Picea canadensis*, at Lake Clear, N. Y., June 7, 1906.

Female. Length 1.5 mm. Antennae a little shorter than the body, sparsely haired, reddish brown; 14 segments, the fifth sessile, ovate with a length three-quarters greater than its diameter; terminal segment prolonged, subfusiform. Palpi; the first segment fusiform, the second as long as the first, rather stout, subrectangular, the third two-thirds the length of the preceding, narrowly oval, the fourth a little longer, broadly lanceolate, face dark brown. Mesonotum dark carmine. Scutellum tinged with yellowish, post-scutellum and abdomen dark carmine. Wings hyaline, costa dark brown; halteres yellowish transparent, femora and tibiae yellowish brown, tarsi dark brown with suggestions of annulations; claws stout, strongly curved at the distal third. Ovipositor three-quarters the length of the body, the terminal lobes stout, broad, narrowly rounded. Type Cecid. 156.

***Dasyneura augusta* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 348

This reddish orange female was taken on oak, *Quercus*, at Albany, N. Y., August 6, 1906.

Female. Length 1.25 mm. Antennae one-third the length of the body, sparsely haired, dark brown; 14 segments, the fifth sub-cylindric, with a length one-half greater than its diameter. Palpi; the first segment swollen and rounded distally, the second elongate, subquadrate, stout, the third more slender and the fourth one-half longer than the third; face fuscous. Mesonotum dark brown, sub-median lines fuscous yellowish. Scutellum and postscutellum dark brown. Abdomen reddish orange, the ovipositor fuscous yellowish with the subterminal segment pale orange. Wings hyaline, costa dark brown; halteres pale yellowish. Coxae a variable fuscous and fuscous yellowish, femora yellowish basally, fuscous apically, tibiae fuscous yellowish, darker apically, tarsi dark brown; claws rather slender, strongly curved. Ovipositor moderately long, terminal lobe very long, slender, broadly rounded. Type Cecid. 737.

***Dasyneura rosarum* Hardy**

1850 **Hardy, James.** Ann. Mag. Nat. Hist., s. 2, 6:186

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 348

This dark brown species was reared July 11, 1907 from the folded terminal leaves of rose taken at Albany, N. Y. The insects reared agree so closely with the description of the above named European species that they have been provisionally identified therewith. *Torymus ostensackenii* D.T. was reared from this midge.

Gall. The three terminal leaflets of the branch are folded together longitudinally and contain numerous white larvae. The gall is greenish tinged with brown and about 18 mm long. The general appearance is very similar to the illustration given by Connold in his Vegetable Galls.

Female. Length 2 to 2.5 mm. Antennae extending to the fifth abdominal segment, sparsely haired, fuscous yellowish; 14 segments, the fifth with a stem about one-fourth the length of the basal enlargement, which latter has a length about twice its diameter; terminal segment reduced, broadly oval. Palpi; the first segment short, stout, subquadrate, the second more than twice the length of the first, more slender, the third a little longer and more slender than the second, the fourth a little shorter than the third. Head slightly reddish. Mesonotum dark brown, the submedian lines sparsely haired, fuscous orange. Scutellum fuscous yellowish, post-scutellum lighter. Abdomen sparsely clothed with fine hairs, dark brown, the incisures and venter dark salmon. Wings hyaline, costa light brown; halteres yellowish basally, fuscous apically. Legs a uniform dark brown, femora pale beneath; claws long, slender, strongly curved, the pulvilli a little longer than the claws. Ovipositor pale salmon, about half the length of the abdomen, the terminal lobes long, slender, narrowly oval. Cecid. a1491.

***Dasyneura semenivora* Beutm.**

Violet seed midge

1907 **Beutenmueller, William.** Amer. Mus. Nat. Hist. Bul. 23, p. 390-91 (Cecidomyia)

1910 **Stebbins, F. A.** Springf. Mus. Nat. Hist. Bul. 2, p. 45 (as Cecidomyia)

The work of this species has been known for several years. The late Dr James Fletcher called the writer's attention to the fact that a noted botanist described the distorted fruits produced by this species as the natural production of *Viola dicksonii*. This species is evidently widely distributed, since it is usually present though not abundant, according to the late Doctor Fletcher, in the

vicinity of Ottawa, Canada. It has been found at Albany, N. Y., and taken at Plainfield, N. J. It is stated by Professor Beutenmueller that the gall was first recorded by E. L. Green in 1902¹ and described by E. Brainerd in 1904.² The galls from which the type specimens were reared were taken by Mr W. De W. Miller at Plainfield, N. J., who states that they occur from July until late in October, the mature larvae spinning up and hibernating within the gall.

Gall. The gall is about 1 cm long, 7 cm in diameter, irregular, a variable brown and has been characterized by Doctor Fletcher as a large plumlike gall. The interior consists of a mass of old cells among the seeds, the individual cells being about 2 mm by 1 mm, yellowish gray, adherent and irregularly placed. Professor Beutenmueller states that the gall is about the size of a pea or gooseberry, measures from 6 to 14 mm in diameter and is attached by a short stalk to the base of the plant.

Male. Length 1.25 mm. Antennae nearly as long as the body, thickly haired, dark brown; 14 segments, the fifth with a stem three-quarters the length of the basal enlargement, which latter has a length nearly twice its diameter; terminal segment reduced, narrowly oval. Palpi; the first segment broadly oval, the second with a length over twice its diameter, the third one-half longer than the second, more slender, the fourth a little longer and more slender than the third. Mesonotum shiny dark reddish brown. Scutellum yellowish brown, postscutellum and abdomen dark yellowish brown, the latter thickly haired. Genitalia fuscous. Wings hyaline, costa dark brown, subcosta uniting with the anterior margin near the basal third, the third vein well before the apex. Halteres yellowish transparent. Coxae and femora basally fuscous yellowish; femora distally, and tibiae light brown, the tarsi mostly darker brown; claws evenly curved, the pulvilli shorter. Genitalia; basal clasp segment long, slender; terminal clasp segment short, stout; dorsal plate long, broad, narrowly incised; ventral plate long, broad. Harpes long, broad, tapering, roundly truncate.

Female. Length 2 mm. Antennae extending to the base of the abdomen, thickly haired, dark brown; 16 segments, the fifth sessile, with a length twice its diameter. Ovipositor fuscous yellowish, nearly as long as the abdomen, the terminal lobes large, narrowly oval.

Described from type specimens, Cecid. a1830, kindly donated by Prof. William Beutenmueller.

¹ Pittonia, 5:103.

² Rhodora, 6:15.

***Dasyneura americana* Felt**

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 348 (*D. galii*)

1913 ——— Psyche, 20:136 (*D. americana* proposed)

This deep red species was reared September 1, 1907 from irregular, flower bud galls on bedstraw, *Galium asprellum*, collected at Magnolia, Mass., by Miss Cora H. Clarke.

The earlier name was preoccupied by *D. galii* H. Lw., to which this species is allied, though there is a marked difference in the ventral plate as illustrated by Rubsaamen. There are probably other differences.

Gall. This is an irregularly aborted, flower bud some 3 mm in diameter and containing pale yellowish larvae.

Female. Length 1.5 mm. Antennae extending to the fifth abdominal segment, sparsely haired, dark brown; 15 segments, the fifth with a length twice its diameter, tapering slightly apically, the terminal segment reduced, broadly oval. Palpi; the first segment irregular, the second subrectangular, with a length three times its diameter, the third a little longer and more slender, the fourth only one-quarter the length of the third. Mesonotum shining reddish brown, the submedian lines indistinct. Scutellum and postscutellum fuscous yellowish. Abdomen deep red, the basal segments and distal margins of terminal segments more or less fuscous. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Coxae and base of femora fuscous yellowish, the distal portion of femora, tibiae and tarsi a variable brown, the distal tarsal segments darker; claws strongly curved, the pulvilli longer than the claws. Ovipositor yellowish orange, as long as the abdomen, terminal lobes stout, with a length two and one-half times the diameter, broadly rounded.

Male. Length 1.5 mm. Antennae as long as the body, sparsely haired; 16 segments, the fifth with a stem one-quarter longer than the cylindric basal enlargement, which latter has a length twice its diameter; terminal segment reduced, narrowly oval. Palpi; first segment short, subquadrate, the second irregularly and narrowly ovate, the third one-half longer than the second, slender, the fourth one-half longer than the third, slender. Coloration, alar and pedal characters presumably the same as in the female. Genitalia; basal clasp segment short, stout; terminal clasp segment long, stout; dorsal plate deeply and broadly incised; the lobes broadly rounded, ventral plate long, broadly and roundly emarginate; harpes stout, irregular apically. Type Cecid. a1678k.

***Dasyneura corticis* Felt**

1909 Felt, E. P. Econ. Ent. Jour., 2:289.

1910 ——— Econ. Ent. Jour., 3:355.

This small midge was reared by Miss Cora H. Clarke May 21, 1909 from small willow twigs, *Salix* species, taken in the Arnold

arboretum, Boston, Mass., May 15th. The twigs were infested with supposedly *Rhabdophaga gnaphaloides* galls and the appearance of this insect was accidental, since the midges emerged from apparently normal twigs, there being no external swelling or enlargement to indicate the presence of larvae underneath the bark.

Habitat. The larva of this species, as stated above, lives under the bark in small cavities but does not form an appreciable swelling.

Male. Length 2 mm. Antennae nearly as long as the body, sparsely haired, dark brown; presumably 16 segments, the fifth with a stem three-quarters the length of the cylindric basal enlargement, which latter has a length twice its diameter, the subbasal whorl sparse, the subapical whorl broad, thick; terminal segment wanting. Palpi; first segment short, subquadrate, the second one-half longer, stout, the third a little longer than the second, more slender, the fourth one-quarter longer than the third. Mesonotum dull black, the submedian lines sparsely haired. Scutellum fuscous yellowish, postscutellum a little darker. Abdomen a variable dull reddish orange; genitalia fuscous yellowish. Wings hyaline, costa pale straw, halteres pale orange, fuscous subapically. Legs a variable fuscous yellowish, the tarsi somewhat darker; claws rather long, slender, evenly curved, the pulvilli a little longer than the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment long, swollen basally; dorsal plate broad, divided; ventral plate long, broad, broadly and deeply emarginate. Harpes stout, irregularly chitinized apically.

Female. Length 1.75 mm. Antennae extending to the base of the abdomen, sparsely haired, dark brown; 15 segments, the fifth with a length two and one-half times its diameter, the subbasal whorl rather thick, subapical band broad, scattering; terminal segment greatly produced, with a length fully six times its diameter and evidently composed of two closely fused segments. Palpi; nearly as in the male. Mesonotum dull brown, the submedian lines sparsely haired. Scutellum fuscous reddish, postscutellum fuscous yellowish. Abdomen deep red. Ovipositor about one-third the length of the abdomen, yellowish, the terminal lobes slender, with a length four times their width, narrowly rounded. Type Cecid. a1966.

***Dasyneura salicifolia* Felt**

1907 Felt, E. P. New Species of Cecidomyiidae II, p. 12

1908 ——— N. Y. State Mus. Bul. 124, p. 293, 348, 350

This dark brown species was reared in August 1907 from young, terminal, adherent, willow, *Salix*, leaves taken at Albany, N. Y. Apparently the same gall was collected by Miss Cora H. Clarke at Magnolia, Mass., June 11, 1909.

Gall. The affected leaves form a fusiform pod some 10 mm long, 2 mm in diameter (pl. 9, fig. 2) and contain several large, deep orange larvae. The apex may be more or less discolored.

Larva. Length 2.5 mm, deep orange.

Male. Length 1.5 mm. Antennae nearly as long as the body, thickly haired, fuscous yellowish, basally with silvery hairs ventrally; 16 segments, the fifth with a stem as long as the basal enlargement, which latter has a length about one-quarter greater than its diameter; terminal segment produced, with a length over twice its diameter and tapering from the basal third to an irregularly rounded apex. Palpi; the first segment short, stout, with a length about twice its diameter, slightly expanded distally, the second about as long, stouter, the third one-quarter longer than the second, more slender, the fourth one-half longer than the third; face with patches of short, silvery hairs. Mesonotum dark brown, the lateral and submedian lines distinct and rather thickly clothed with long, pale brown hairs. Abdomen dark brown dorsally, silvery laterally, pleurae with patches of silvery hairs interrupted beneath. Wings hyaline, costa dark brown. Halteres pale yellowish. Coxae pale yellowish with silvery hairs, femora pale silvery at base, fuscous apically; tibiae and tarsi darker; claws long, stout, strongly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment stout at base; dorsal plate short, broad, divided; ventral plate short, stout, deeply and triangularly emarginate; harpes long, stout, tapering, irregularly tuberculate.

Female. Length 2 mm. Antennae extending to the second abdominal segment, sparsely haired, fuscous yellowish; 15 segments, the fifth subsessile, subcylindric, with a length one-half greater than its diameter; terminal segment produced, with a length fully three times its diameter, the distal portion tapering to an obtuse point. Palpi; the first segment stout, slightly expanded distally and with a length about twice its diameter, the second as long as the first, more slender, the third one-half longer than the second, more slender and the fourth a little longer and more slender than the third. Ovipositor nearly as long as the abdomen, the terminal lobes rather long, slender, narrowly rounded. Type Cecid. a1675.

Dasyneura gibsoni Felt

1911 Felt, E. P. Econ. Ent. Jour., 4:479

Specimens of this midge were reared from flower heads of Canada thistle, *Cirsium arvense*, collected by Arthur Gibson in the vicinity of Ottawa, Canada, in August 1911. The larvae occur here and there among the florets and, according to Mr Gibson, are of material service in checking this weed. Specimens of the same species were received from Dr Fernandus Payne of Indiana University, Bloomington, Ind., accompanied by the statement that

they are not only checking the thistle, but in some parts of the State appear to have almost completely destroyed the weed. *Trypeta ruficauda* Fabr. was also reared from the Canadian material.

***Dasyneura fulva* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 349

This orange yellow female was taken on huckleberry at Nassau, N. Y., June 14, 1906.

Female. Length 1.35 mm. Antennae extending to the middle of the abdomen, dark brown, thickly haired; 15 segments, the fifth with a length two and one-half times its diameter; terminal segment produced and evidently composed of two closely fused. Palpi; first segment rather long, quadrate, the second roundly rectangular, the third one-half longer than the second, more slender, the fourth a little longer than the third, somewhat dilated. Mesonotum dark brown, the yellowish submedian lines sparsely haired. Scutellum dark reddish, postscutellum fuscous yellowish. Abdomen dull orange yellowish with indistinct fuscous markings on the basal and terminal segments. Wings hyaline, costa reddish brown. Halteres yellowish transparent. Legs a nearly uniform pale brown; claws strongly curved, the pulvilli nearly as long as the claws. Ovipositor as long as the body; terminal lobes slender, with a length three times the width, narrowly rounded. Type Cecid. 257.

***Dasyneura ulmea* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 349

This dark brown species was reared May 7, 1886 from aborted elm buds evidently taken in the vicinity of Washington, D. C., presumably by Mr Pergande. Apparently the same gall was collected at Jamaica Plain, Mass., by J. G. Jack.

Gall. The deformity is simply a collection of aborted buds, one fly at least, issuing from a circular hole a little before the apex.

Female. Length 1.5 mm. Antennae extending to the fourth abdominal segment, rather thickly haired, light brown; 16 segments, the fifth with a length one-half greater than its diameter; terminal segment narrowly rounded, greatly produced and evidently composed of two or more closely fused segments. Palpi; first segment irregular, rather stout, the second a little longer, broader, the third one-half longer than the second, more slender, the fourth a little longer and more slender than the third. Mesonotum dark brown. Scutellum and postscutellum fuscous yellowish. Abdomen a variable dark brown, sparsely clothed with very fine, short hairs. Wings hyaline, costa light brown. Halteres yellowish transparent basally and apically, slightly fuscous subapically. Legs a variable yellowish brown, the tarsi slightly darker; claws strongly curved, uniden-

tate, the pulvilli a little longer than the claws. Ovipositor probably as long as the abdomen; terminal lobes slender, with a length five times the width. Type *Cecid.* 880.

***Dasyneura leguminicola* Lintn.**

Clover seed midge

- 1879 **Lintner, J. A.** Can. Ent., 11:44-45 (*Cecidomyia trifolii*);
p. 121-24 (*leguminicola* proposed)
1879 ——— Amer. Nat., 13:190 (*Cecidomyia trifolii*)
1879 ——— Country Gentleman, 44:455, 631 (*Cecidomyia*)
1879 **Riley, C. V.** Com'r of Agric. Rep't, p. 250-52 (*Cecidomyia*)
1880 **Comstock, J. H.** Com'r of Agric. Rep't, p. 193-97 (*Cecidomyia*)
1880 **Lintner, J. A.** N. Y. State Agric. Soc., 39th Rep't, p. 37-41 (*Cecidomyia*)
1880 ——— Ent. Soc. Ont. Rep't 1879, p. 28-30 (*Cecidomyia*)
1880 **Riley, C. V. & Howard, L. O.** Insect Life, 1:142-43 (*Cecidomyia*)
1881 **Saunders, William.** Ent. Soc. Ont. 12th Rep't p. 38-43 (*Cecidomyia*)
1881 **Lintner, J. A.** N. Y. State Agric. Soc., 40th Rep't, p. 20-24 (*Cecidomyia*)
1882 **Saunders, William.** Ent. Soc. Ont. Rep't 1881, p. 38-43
1885 **Fletcher, Jas.** Dep't Agr. (Can.) Rep't Ent. Sep. p. 12-13
1889 **Forbes, S. A.** Nox. & Benef. Ins. Ill., 15th Rep't, p. 3 (*Cecidomyia*)
1889 **Lintner, J. A.** Ins. of N. Y., 5th Rep't, p. 262-63 (*Cecidomyia*)
1891 **Ormerod, E. A.** Ins. Life, 3:293-94 (*Cecidomyia*)
1891 ——— Injur. Ins. & Common Farm Pests, 14th Rep't, p. 23-27 (*Cecidomyia*)
1894 **Comstock, J. H.** Manual for the Study of Insects, p. 446
1894 **Davis, G. C.** Mich. Agr. Expt. Sta. Bul. 116, p. 52-56
1898 **Lintner, J. A.** Ins. of N. Y., 13th Rep't, p. 359 (*Cecidomyia*)
1899 **Hunter, W. D.** Neb. State Bd. Agr. Rep't, 1898, p. 247-49
1901 **Howard, L. O.** Insect Book, p. 115
1906 **Webster, F. M.** U. S. Dep't Agric., Bur. Ent. Cir. 69, p. 3-7
1907 **Bethune, C. J. S.** Ont. Agric. Col. 32d Rep't, p. 46
1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 349, 350
1909 **Folsom, J. W.** Ill. Agr. Expt. Sta. Bul. 134, p. 118-25
1910 **Gibson, Arthur.** Canada, Central Expt. Farm Rep't, 1909. Separate, p. 52 (*Cecidomyia*)
1910 **Pettit, R. H.** Mich. Agr. Expt. Sta. Bul. 258, p. 49-50 (*Cecidomyia*)

This small midge is so abundant as to render it practically impossible to grow clover seed in western New York and also in other parts of the country, though there are no recent reports of its occurring in such numbers as were observed in earlier years. The species was first brought to notice when Doctor Lintner's attention was called to some minute maggotlike creatures in the heads of red clover. It caused serious injuries to clover in Tompkins, Seneca and other counties in western New York during 1878.

The damage was so extensive in some places that fields of clover, grown for seed, were found not worth cutting at that time. Prof. William H. Brewer of Yale College stated that his father, Henry Brewer of Enfield Center, Tompkins county, who was an enthusiastic grower of clover and clover seed, was familiar before 1848 with an insect which attacked clover and was presumably this species. Some idea of the abundance of the pest may be gained from the following. In 1888 Miss E. J. Phillips, writing to the Department of Agriculture at Washington, stated that her brother had cut enough clover in the morning to feed 12 cows at night, and allowed it to lie in the wagon all day and when he removed it therefrom at night the bottom of the wagon was literally pink with larvae. Doctor Lintner has placed on record an instance where the second crop of clover was cut and put on the scaffolding above the barn floor. Four or five days later large numbers of the larvae were observed upon the floor beneath, giving it an appearance of having been sprinkled with red sand. Mr C. W. Stewart of Newark, N. Y., communicating with this office in 1897, stated that the crop of clover seed on 25 acres was completely ruined by this insect. Doctor Fletcher has recorded serious injury in Ontario and Professor Davis in Michigan.

Distribution. This species is known to occur generally in New York State. It has been recorded from Ohio, Michigan, Illinois, the District of Columbia, Virginia, Ontario, Canada, and is probably widely distributed over the eastern half of this country at least. Miss Ormerod has also recorded the species from England.

Name and identity. This species was first described by Doctor Lintner in February 1879 as *Cecidomyia trifolii*, the present name of *leguminicola* being proposed later, because *trifolii* was preoccupied by an European species. More recently this insect has been removed from the genus *Cecidomyia* and is now known as *Dasyneura leguminicola* Lintn.

This small, fragile, dark brown and reddish midge can not be readily separated from the European clover leaf midge, *Dasyneura trifolii* Loew, which has become well established in this country. *Dasyneura leguminicola* may be most easily distinguished by the relatively large wings and the straight third vein in connection with the very long, slender ovipositor, this organ being distinctly longer than the body, while the lobes are relatively short and stout and have a length only about three and one-half times their breadth. The venter of the abdominal seg-

ments is ornamented apically with a rather thin, irregular row of setae. The female normally has 16 subsessile antennal segments, the fifth with a length about two and one-half times its diameter, while the sixteenth is never reduced, and in some cases at least, is evidently composed of two closely fused segments. The male has 16 or 17 antennal segments, the fifth with a stem as long as the basal enlargement, which latter has a length one-half greater than its diameter.

Life history. There appear to be two and possibly three generations annually, since Doctor Lintner states that the flies begin to make their appearance the latter part of May, and larvae and adults have been observed at various times during July, August and often in September. It is probable that this species will breed at any time when clover heads afford favorable conditions, namely, from early summer until late in the fall. Professor Davis calls attention to the fact that the appearance of the midges is controlled to a considerable extent by weather conditions, they refusing to emerge when there was a dearth of moisture. This is to be expected and agrees with the behavior of the Hessian fly, *Phytophaga destructor* Say, under similar conditions.

The life history of this species has been worked out in Illinois in some detail by Dr J. W. Folsom, an abstract of his observations being given below. The insect winters as a full-grown larva or pupa in the soil of clover fields or in dead clover heads. A few warm days and a little rain suffice to bring the larvae to the surface of the ground a few days after red clover has started its second year's growth. This latter occurred at Urbana, in 1907, March 19th and the orange colored larvae were found March 25th to April 4th inclusive, being most numerous on March 30th and April 2d. Some of these larvae make a cocoon while others do not. All contract in length, the integument hardens, becomes duller in color, forming a puparium within which the insect develops. Midges were taken outdoors May 15th but were not common till May 23d (oviposition then being in progress) and attained their maximum numbers May 30th. The larvae work in the heads during June and the first week in July, leaving them when full grown and entering the ground to pupate. Most of the larvae desert the heads about June 30th, though not a few may be found as late as July 8th. Three weeks or more are required for the transformation from the larva to the adult, the second generation being most abundant the last week of July and the first two weeks of August, though

scattering individuals may emerge at almost any time between the middle of July and the first of September. The egg period in early July is three days. Most of the injury to the seed crop is inflicted during the last two weeks of August and the first two weeks of September, at a time when the larvae are most numerous in the clover heads. Most of the insects winter as larvae and emerge as flies the following May. A few, however, transform and produce flies in early September or even later. Midges were obtained in the insectary without artificial heat as late as October 10th and in a warm room they were reared throughout the winter. These late appearing flies are unable to propagate their kind, owing to the frost killing the flies, and especially to the green clover heads dying before the larvae of the third generation can complete their growth. There is a possibility that larvae from flies appearing in early September may be wintered in safety. Doctor Folsom concludes that in central Illinois there are two full broods and a partial third generation.

Habits. The eggs are always laid in green flower heads and chiefly during the warmer part of the day, the female being frequently so busy as to pay no attention to slight interruptions. Standing on the outside of a green clover head the female inserts her long, slender ovipositor among the florets and works it deeper and deeper until it can go no further. The female then becomes quiet until an egg is laid, the entire process usually requiring 5 minutes and often 10 to 15 minutes. One female may lay several eggs in a clover head though she appears to make it a rule to distribute her eggs among a number of plants. Many females may oviposit in the same head and, as a result, more larvae hatch than can possibly find food. Thus, in one head of 80 florets Doctor Folsom found 106 eggs. Once in a while an egg is laid on a petal or on the calyx itself but almost always it is glued to one of the hairs of the immature calyx, the glue often forming quite a perceptible mass. The abundance of the larvae in a head is confirmed by the following observation from Professor Comstock: "A head, which one moment is motionless and at a glance seems to have no animal life about it, becomes the next fairly swarming with these maggots. From nearly every closed floret one emerges and wriggles violently until it works itself away so far that it falls to the ground. A batch of clover which was observed by Doctor Howard on the morning of May 23d last seemed entirely alive with the issuing maggots and their accompanying parasitic foes."

The newly hatched larva has but one way of entering the ovary of a flower, namely, by squeezing in between the unopened petals. Once inside the flower bud the maggot sucks or absorbs the fluid contents of the ovary, destroying the ovule or ovules. An affected floret presents externally a healthy appearance though the petals rarely expand. They remain fresh and pink until the maggot leaves the bud and eventually fade and wither without opening. The larvae when full grown may simply drop from the head or, when moisture is abundant, may wriggle their way down the stem of the plant. The larvae, although full grown, may not emerge if the air is too dry. Dryness causes them, even when on the ground, to squeeze themselves into crevices in the soil and to contract the body and become motionless as if for pupation; even then moisture will repeatedly revive them to a condition of wriggling activity. The duration of the pupa stage is prolonged by dryness and shortened by moisture. An extended dry spell kills both larvae and pupae. Continued dry weather may delay the appearance of flies as much as two weeks though they may be expected to emerge after a timely rain.

Natural enemies. Two undetermined Chalcids belonging to the genus *Tetrastichus* were reared by Doctor Folsom from this insect. They are possibly the same as those mentioned by Webster as having been reared from both larvae and pupae obtained about Lincoln, Neb. Sanderson reared in Delaware, from the larvae of the seed midge, in October 1899 and June 1900, parasites determined by Ashmead as *Tetrastichus carinatus* Forbes and a *Torymus*. Another parasite is *Anopedias* error Fitch, family *Platygasteridae*, a minute, black species which has received little mention since Comstock reported upon it in 1880. The common flower bug, *Triphleps insidiosus* Say, is, according to Doctor Folsom, an efficient enemy of this insect. He repeatedly found a nymph or an adult of this bug with its beak thrust into a larva or fly of this pest.

Several parasites were reared by us from the various collections of clover heads infested by this midge, namely, *Telenomus podisi* Ashm., *Polynema striaticornis* Girault, *Decatoma* sp. and *Polygnotus* sp.

Control. This species can be best controlled by cutting the first crop of clover as early as possible in order to secure a good seed crop at the expense of a slight reduction in the hay crop. This early cutting results in drying up the food plant and the undeveloped

larvae, and hastens the development of a second lot of clover heads so that the midges of the second generation find but few green heads in which to lay their eggs. The proper date for early cutting depends on latitude, weather and other conditions. This, in central Illinois, according to Doctor Folsom, should not be later than June 17th and need not be earlier than June 7th. A clover head half red and half green means that the seed midge is present (or else the seed caterpillar, *Enarmonia interstinctana* Clem.) and the grower who will take the trouble to study the habits of the midge will be able to cut his clover at just the right time to get rid of the midge without losing much of his hay crop. Similar results may be obtained by mowing back the clover as early as the middle of May in Illinois and Ohio, since this delays heading enough to escape the second brood of flies. Pasturing in spring and early summer exterminates the midge and yet insures a good crop of seed so far as this insect is concerned.

Doctor Folsom's observations show that the seed midge neither flies far nor is it carried any great distance in large numbers by the wind. Most of the midges remain and deposit eggs in the field where they develop. During windy spells they cling to the herbage or to the ground and take but short and occasional flights. This habit, in Doctor Folsom's opinion, justifies preventing the sporadic heading of first year clover by mowing it back a few weeks after oats (or other small grains) have been harvested, at a time when the growth is vigorous but yet sufficiently early to permit considerable further growth before frost sets in. Where clover and timothy are sowed together the field may be pastured lightly or clipped back in May, since this brings both the first and second blooming of the clover too late for the destructive work by the midge, and the hay crop as a whole is uninjured.

***Dasyneura gemmae* Felt**

1909 **Felt, E. P.** Econ. Ent. Jour., 2:288

This species was reared in late March and early April 1909 from small, conic, apical bud galls on willow, *Salix* and received from Mr C. P. Smith of Logan, Utah. The galls are diminutives of the familiar deformities produced by *Rhabdophaga strobiloides* Walsh.

Male. Length 2 mm. Antennae as long as the body, sparsely haired, light brown; 18 segments, the fifth with a stem one-quarter longer than the cylindric basal enlargement, which latter has a length one-half greater than its diameter; subbasal whorl rather

thick, subapical band very thick and long; terminal segment slightly produced, narrowly oval. Palpi; first segment subquadrate, the second narrowly oval, with a length three times its diameter, the third and fourth subequal, each one-half longer than the second. Mesonotum dull black, the submedian lines sparsely haired. Scutellum dull orange, postscutellum fuscous. Abdomen sparsely haired, the dorsal sclerites dark brown, the pleurae and venter fuscous yellowish. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Coxae and femora basally fuscous yellowish, the remainder of the legs mostly dark brown; tarsi nearly black; claws slender, strongly curved, the pulvilli a little shorter than the claws. Genitalia; basal clasp segment stout, subtruncate; terminal clasp segment swollen basally; dorsal plate very short, broad, broadly and triangularly emarginate; ventral plate long, deeply and roundly emarginate; harpes stout.

Female. Length 2.5 mm. Antennae extending to the second abdominal segment, sparsely haired, light brown; 16 segments, the fifth with a length two and one-half times its diameter; subbasal whorl sparse, the subapical band rather sparse; terminal segment somewhat produced, tapering distally. Ovipositor as long as the body, the terminal lobes very long, slender, with a length about six times the width. Other characters nearly as in the male. Type Cecd. a1937a.

Dasyneura radifolii Felt

1909 **Felt, E. P.** Econ. Ent. Jour., 2:289

This species was reared April 16 to 20, 1909 in some numbers from irregular, oval galls formed of root leaves on *Solidago puberula* or *S. juncea* taken by Miss Cora H. Clarke at Magnolia, Mass.

Gall. Greenish, irregular, oval, about 1 cm long, composed of clusters of root leaves and inhabited by several larvae.

Larva. Length 3mm, pale orange. Head small; antennae relatively long, slender; breastbone rather conspicuous, bidentate, becoming obsolete posteriorly. Skin coarsely shagreened. Posterior extremity broadly rounded, slightly bilobed and with inconspicuous sublateral tubercles.

Male. Length 1.5 mm. Antennae one-half longer than the body, sparsely haired, dark brown; 17 segments, the fifth with a stem one-quarter longer than the cylindric basal enlargement, which latter has a length two and one-half times its diameter; subbasal whorl thick, subapical band thick, long; terminal segment reduced, narrowly oval. Palpi; first segment short, irregular, second narrowly oval, with a length three times its diameter, the third one-half longer, slender, the fourth one-quarter longer than the third, slender. Mesonotum dark brown, the submedian lines sparsely

haired. Scutellum reddish brown, postscutellum orange brown. Abdomen dark reddish brown, the distal segments dark orange; genitalia fuscous. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Coxae dark brown; femora basally yellowish, the distal portion of femora, tibiae and tarsi mostly dark brown; claws slender, strongly curved, the pulvilli a little shorter than the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment rather stout, slightly swollen near the middle; dorsal plate broad deeply and triangularly incised; ventral plate broad, deeply and roundly emarginate; harpes rather long, slender.

Female. Length 2 mm. Antennae extending to the third abdominal segment, sparsely haired, dark brown, yellowish basally; 16 cylindric segments, the fifth with a length two and one-half times its diameter; terminal segment produced, with a length four times its diameter. Mesonotum dull black. Scutellum fuscous yellowish, postscutellum pale orange. Abdomen dark brown, the incisures and pleurae mostly deep reddish orange. Halteres yellowish basally, fuscous apically; coxae and femora basally fuscous yellowish. Ovipositor pale yellowish, as long as the body, the terminal lobes broad, with a length only three times the width. Other characters as in the male. Type Cecd. a1911.

Dasyneura albovittata Walsh

1864 **Walsh, B. D.** Ent. Soc. Phila. Proc., 3:620-23 (Cecidomyia)

1895 **Comstock, J. H.** Manual for the Study of Insects, p. 446 (Cecidomyia)

1906 **Felt, E. P.** N. Y. State Mus. Mem. 8, 2:746 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 352, 354

This small inquiline is very common in the familiar terminal pine cone galls of *Rhabdophaga strobiloides* Walsh. The pale yellowish larvae occur between the bracts of the gall and do not interfere in any way with the development of the species primarily responsible for the gall, though they are usually much more abundant than the larger form. This species was bred very commonly during April from pine cone galls on *Salix* taken at West Nyack. Walsh states that adults appear from the 10th of April to the Middle of May, a second brood emerging the latter part of July to September 11th. This species normally has 16 segments in both sexes, though occasionally specimens of the male may have 15 or 17 segments. The species described below is tentatively identified with the one reared by Walsh.

Description. The slightly mottled, orange colored larva of this species has a bidentate breastbone and is only about .75 mm in length.

Male. Length 1.25 mm. Antennae a little longer than the body, rather thickly haired, dark brown, usually 16, occasionally 15 or 17 segments, the fifth with a stem as long as the cylindric basal enlargement, which latter has a length three-quarters greater than its diameter; terminal segment narrowly oval, subacute. Palpi; the first segment irregular, the second subrectangular, with a length nearly three times its diameter, the third one-half longer, more slender, the fourth longer than the third, more slender. Mesonotum shining reddish brown, the submedian lines sparsely haired. Scutellum fuscous yellowish, postscutellum darker. Abdomen sparsely haired, dark brown; genitalia fuscous yellowish. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Coxae light brown; femora and tibiae mostly dark brown, the tarsi nearly black; claws slender, strongly curved, the pulvilli as long as the claws. Genitalia; dorsal plate long, broad, broadly and triangularly incised, the divergent lobes narrowly rounded apically; ventral plate long, broad, deeply and broadly emarginate, the lobes long, tapering, irregularly. Harpes short, stout.



Fig. 20 Galls of *Dasyneura communis* (natural size, original)

Female. Length 1.5 mm. Antennae extending to the third abdominal segment, sparsely haired, light brown, yellowish basally; 15-16 sub-cylindric, sessile segments, the fifth with a length two and one-half times its diameter, terminal segment reduced, sometimes slightly fused with the preceding. Mesonotum dark brown, the submedian lines thickly clothed with yellowish hairs, the anterior lateral angles and base of the wings yellow haired. Scutellum fuscous yellowish, with a few coarse setae apically, post-scutellum yellowish. Abdomen deep red, the dorsal sclerites sparsely clothed with dark brown scales, the latter thicker on the posterior margin.

Ovipositor slightly fuscous basally, yellowish apically. Halteres pale yellowish orange, somewhat fuscous subapically. Coxae apically and femora basally yellowish or whitish yellow, the distal portion of femora, tibiae and tarsi dark brown or nearly black. Ovipositor as long as the body, the terminal lobes with a length about four times the width, narrowly rounded apically. Other characters as in the male. Cecid. a1442a.

***Dasyneura communis* Felt**

1911 **Felt, E. P.** Econ. Ent. Jour., 4:478-79

This species was reared in early spring of 1909 from jars containing soft maple, *Acer rubrum*, leaves bearing thickened pouch galls along the veins. The galls are often reddish (pl. 2, fig. 6) on the upper side and have a length of one-fourth inch or more. It was also obtained from a number of jars containing various galls and debris. There is grave doubt as to this species causing the gall mentioned above. A species of *Polygnotus* was reared from this gall.

***Dasyneura rufipedalis* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 349

This dark brown species was taken on red clover at Karner, N. Y., June 4, 1906.

Female. Length 1 mm. Antennae extending to the third abdominal segment, sparsely haired, dark brown; 16 segments, the fifth slightly oval, with a length three-quarters greater than its diameter; terminal segment reduced, narrowly oval. Palpi; first segment short, subquadrate, the second swollen, roundly rectangular, the third one-half longer, slender, the fourth one-half longer than the third. Mesonotum dark brown, the distinct submedian lines yellow haired. Scutellum yellowish brown, postscutellum reddish brown. Abdomen dark brown, sparsely clothed with fine hairs. Wings hyaline, costa dark brown. Halteres yellowish transparent. Femora mostly pale straw, brownish apically; tibiae and tarsi reddish brown; distal tarsal segments slightly darker; claws slender, strongly curved, the pulvilli about as long as the claws. Ovipositor longer than the body, the terminal lobes slender, with a length more than four times the width, narrowly rounded. Type Cecid. 127.

***Dasyneura purpurea* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 349

This dark brown species was reared September 27, 1907 from enlarged florets of the Joe-Pye weed, *Eupatorium purpureum*, taken both on Staten Island and at Karner, N. Y.

Gall. Length 1 cm, diameter .4 cm. An oval or fusiform, bud-like, purplish enlargement (pl. 4, fig. 15) inhabited by yellowish larvae.

Female. Length 2 mm. Antennae extending to the third abdominal segment, sparsely haired, dark brown; 16 segments, the

fifth with a length twice its diameter, the terminal segment slightly reduced, narrowly oval. Palpi; first segment short, stout, irregularly subquadrate, the second roundly rectangular, the third one-half longer, rather stout, the fourth longer than the third, somewhat dilated. Mesonotum shining dark brown, the submedian lines thickly haired. Scutellum and postscutellum pale or fuscous orange. Abdomen dark brown, the incisures deep orange. Wings hyaline, costa dark brown. Halteres pale orange. Coxae and base of femora yellowish straw, the distal portion of femora and tibiae fuscous yellowish, the tarsi dark brown; claws rather slender, strongly curved, the pulvilli as long as the claws. Ovipositor one-half longer than the body; terminal lobe slender, with a length three times its width, narrowly rounded. Type Cecid. a 1693a.

Dasyneura lysimachiae Beutm.

1907 **Beutenmueller, William.** Can. Ent., 39:305-6 (Cecidomyia)

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 349, 350

This species was reared in August 1906 from a terminal conic leaf gall on the whorled loosestrife, *Lysimachia quadrifolia*, taken at Albany, N. Y. A similar gall, possibly that of this species, was found on *L. terrestris* August 9, 1912, at Elm Lake in the Adirondacks. *Eupelmus dryorhizoxeni* Ashm. was reared from an axillary bud gall possibly produced by the same midge.

Gall. This is a conical enlargement of the terminal bud (pl. 9, fig. 2) and contains a number of yellowish larvae.

Male. Length 2.5 mm. Antennae one-quarter longer than the body, thickly clothed with long hairs, brown; 16 segments, the fifth with a stem one-quarter longer than the basal enlargement; terminal segment slightly produced, narrowly oval. Palpi; the first segment long, subtriangular, swollen distally, the second as long as the first, narrowly oval, the third one-half longer than the second, more slender, the fourth about as long as the third. Genitalia; basal clasp segment long, stout; terminal clasp segment short, stout greatly swollen near the middle; dorsal plate long, broad, deeply and triangularly incised; ventral plate long, broad, broadly and roundly emarginate. Harpes short, stout, tapering to a heavy, chitinous spur about one-quarter the length of the organ. Other characters nearly as in the female.

Female. Length 1 mm. Antennae extending to the third abdominal segment, sparsely haired, brown; 17 segments, the fifth subsessile, cylindric, with a length nearly thrice its diameter; terminal segment produced, tapering, narrowly rounded apically. Palpi; the first segment stout, expanded distally, the second narrowly oval, as long as the first, the third more slender, twice the length of the

second, the fourth a little longer than the third, slightly more dilated. Face fuscous yellowish. Mesonotum dark brown, the submedian lines thickly yellow haired. Scutellum pale yellowish, postscutellum fuscous yellowish. Abdomen blood-red, the segments margined posteriorly with yellow hairs. Wings hyaline, costa dark brown. Halteres yellowish basally, reddish apically. Coxae and basal portion of femora a variable yellowish, the femora apically, and tibiae a variable brown, tarsi a nearly uniform dark brown; claws long, slender, the pulvilli as long as the claws. Ovipositor nearly as long as the body, the terminal lobes very long, slender, narrowly rounded.

Described from a type kindly donated for study by Prof. William Beutenmueller. Cecid. 1240.

***Dasyneura flavoabdominalis* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 350

This yellowish species was taken on solidago at Albany, N. Y., August 6, 1906.

Female. Length 2.5 mm. Antennae two-thirds the length of the body, sparsely haired, dark brown, fuscous yellowish basally; 16 segments, the fifth subcylindric, with a length twice its diameter. Palpi; the first segment subquadrate, second a little longer, suborbicular, the third twice the length of the second, more slender, the fourth one-half longer than the third, more slender, slightly enlarged distally. Mesonotum brownish black, submedian lines with sparse, yellowish hairs. Scutellum and postscutellum yellowish white. Abdomen yellowish orange, membrane and pleurae lighter, dorsally sparsely clothed with fuscous scales, ovipositor fuscous yellowish. Wings hyaline, costa dark brown, halteres pale yellowish. Coxae fuscous orange, femora and tibiae fuscous yellowish, tarsi light brown; claws rather slender, strongly curved. Ovipositor longer than the insect, terminal lobe slender, broadly rounded. Type Cecid. 738.

***Dasyneura cercocarpi* Felt**

1913 **Felt, E. P.** N. Y. Ent. Soc. Jour., 21:215-16

The midges described elsewhere were reared in April from an imbricated bud gall on *Cercocarpus parvifolius* collected by Prof. E. Bethel at Golden, Col.

***Dasyneura aromaticae* Felt**

1909 **Felt, E. P.** Econ. Ent. Jour., 2:289

This species was reared August 23, 1908 from sprigs of mint taken at Barre, Mass., by Miss Cora H. Clarke.

Gall. An ovoid, hairy, green, axillary or terminal gall about 4 mm in length. The adults undergo their final transformations in

whitish, oval cocoons about 3 mm long, irregularly placed among the distorted leaflets.

Male. Length 1.25 mm. Antennae as long as the body, rather thickly haired, dark brown; 14 segments, the fifth with a stem as long as the basal enlargement, which latter has a length one-half greater than its diameter, terminal segment slightly reduced, broadly oval. Palpi; the first segment irregularly subquadrate, the second broadly oval, with a length three times its diameter, the third more slender, the fourth only slightly longer than the third. Scutellum fuscous yellowish, postscutellum dark brown. Abdomen yellowish brown, the basal segments and genitalia fuscous. Wings hyaline, costa dark brown. Halteres yellowish, fuscous apically. Coxae and base of femora yellowish, the distal part of femora, tibiae and tarsi dark brown; claws slender, curved, the pulvilli as long as the claws. Genitalia; basal clasp segment stout, terminal clasp segment long, slightly swollen basally; dorsal plate broad, deeply and roundly emarginate, ventral plate short, broadly and roundly emarginate. Harpes stout, roundly truncate. Type Cecid. a1875.

Dasyneura attenuata Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 350

The male was taken at Albany, N. Y., June 9, 1907 in a sweep capturing *D. graminis*. It was at first presumed to belong to that species.

Male. Length .75 mm. Antennae longer than the body, sparsely haired, dark brown; 16 segments, the fifth with a stem one-quarter longer than the basal enlargement; terminal segment reduced, narrowly oval, subacute distally. Palpi; the first segment short, stout, subquadrate, the second a little longer, narrowly oval, the third one-half longer than the second, more slender, the fourth a little longer than the third. Face fuscous. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum brown, postscutellum a little darker. Abdomen dark reddish orange. Wings hyaline, costa light brown. Genitalia; basal clasp segment short, stout; terminal clasp segment stout, swollen basally; dorsal and ventral plates short, broadly and triangularly incised. Harpes short, stout, tapering, obtuse, with an irregular, subquadrate tooth.

Described from a dried specimen. Type Cecid. 1209b.

Dasyneura flavoscuta Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 350

This reddish brown species was taken on *solidago* at Albany, N. Y., July 16, 1906.

Female. Length 2mm. Antennae extending to the fourth abdominal segment, rather thickly clothed with long hairs, dark brown, fuscous basally; 17 segments, the fifth sessile, subcylindric, with a length two and one-half times its diameter; terminal

segment rather reduced, obovoid. Palpi; the first segment short, subquadrate, slightly swollen distally, the second narrowly oval, the third a little longer and more slender than the second, the fourth longer than the third; face fuscous, eyes large, black. Mesonotum dark brown with narrow, yellowish submedian lines. Scutellum light fuscous yellow. Abdomen reddish brown, incisures and pleurae deep carmine, dorsal sclerites sparsely clothed with pale brown setae. Ovipositor pale yellowish, terminal segments irregularly ornamented with long, black hairs. Wings subhyaline, costa dark brown; halteres pale yellowish basally, semitransparent apically. Legs nearly uniform fuscous; claws stout, uniformly curved. Ovipositor as long as the body; the terminal lobes long, slender, broadly rounded. Type Cecid. 553.

***Dasyneura consobrina* Felt**

1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 118. Separate, p. 21-22

1908 ————— N. Y. State Mus. Bul. 124, p. 350

This fuscous orange species was taken on white pine, *Pinus strobus*, at Albany, N. Y., June 11, 1906.

Female. Length 1.5 mm. Antennae extending to the third abdominal segment, sparsely haired, dark brown; 17 segments, fifth subsessile, subcylindric, with a length twice its diameter; terminal segment suboval. Palpi; the first segment subrectangular, slightly swollen at the distal fourth, the second a little longer, stouter, the third one-half longer, more slender and the fourth one-half longer than the third; face dark brown. Mesonotum dark brown, submedian lines pale, sparsely ornamented with fine setae. Scutellum bright orange with sparse apical setae, postscutellum bright orange. Abdomen slightly fuscous orange, the incisures and pleurae bright orange, terminal segments yellowish, sparsely ornamented with fine, pale yellowish setae. Wings hyaline, costa pale reddish; halteres yellowish transparent basally, whitish transparent apically. Coxae and femora pale straw, tibiae and tarsi rather dark brown, the former lighter ventrally; claws long, slender, uniformly curved. Ovipositor three-quarters the length of the body, the terminal lobes long, tapering, narrowly rounded. Type Cecid. 215.

***Dasyneura meliloti* Felt**

1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 116. Separate, p. 20

1908 ————— N. Y. State Mus. Bul. 124, p. 350

This dark brown species was taken on sweet clover, *Melilotus alba*, at Albany, N. Y., August 6, 1906.

Male. Length 1 mm. Antennae a little longer than the body, sparsely haired, dark brown; 17 segments, the fifth with a stem three-quarters the length of the basal enlargement, which latter has a length three-quarters greater than its diameter; terminal seg-

ment short, subcylindric, tapering, broadly rounded. Palpi; first segment subquadrate, the second nearly twice as long as the preceding, the third one-half longer than the second, and the fourth a little longer than the third. Face fuscous. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum reddish brown, postscutellum slaty brown. Abdomen dark brown, membrane and pleurae yellowish; genitalia dark brown. Wings hyaline, costa dark brown. Halteres pale yellowish. Coxae fuscous yellowish. Legs mostly dark brown; claws slender, strongly curved. Genitalia; basal and terminal clasp segments stout; dorsal plate broad; ventral plate narrow; both deeply incised. Harpes stout, convolute, the edges irregularly serrate. Type Cecid. 744.

Dasyneura pedalis Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 350

This dark brown form was taken in a trap lantern at Newport, N. Y., June 27, 1906.

Male. Length 1 mm. Antennae longer than the body, sparsely haired, dark brown, yellowish basally; 17 segments, the fifth with a stem one-quarter longer than the basal enlargement, which latter has a length two and one-half times its diameter; terminal segment short, suboval. Palpi; the first segment short, stout, the second one-half longer, stout, the third one-half longer than the second, more slender, the fourth a little longer and more slender than the third. Face yellowish. Mesonotum dark brown, the submedian lines obscurely yellowish. Scutellum deep reddish brown, with sparse apical setae, postscutellum reddish yellow. Abdomen a nearly uniform dark brown, the basal segments somewhat darker, sparsely clothed with fine setae. Wings hyaline, costa light brown. Halteres pale yellowish basally, slightly fuscous apically. Legs nearly uniform dark brown with a fuscous tinge at the articulations; claws long, stout. Genitalia; basal clasp segment stout; terminal clasp segment short, stout; dorsal plate broad, deeply and triangularly incised; ventral plate long, narrow, deeply and roundly incised. Harpes subtriangular, irregularly truncate. Type Cecid. 410.

Dasyneura serrulatae O. S.

- 1862 Osten Sacken, C. R. Monogr. Dipt. N. Am., 1:198 (Cecidomyia)
- 1891 Riley, C. V. & Howard, L. O. Insect Life, 4:125
- 1893 Townsend, C. H. T. Ent. Soc. Wash. Proc., 2:388-89 (Cecidomyia)
- 1900 Smith, J. B. List of Insects N. J., p. 621 (Cecidomyia)
- 1906 Felt, E. P. Insects Affect. Prk. & Wldd. Trees, 2:750
- 1907 Jarvis, T. D. Ent. Soc. Ont. 37th Rep't, p. 68
- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 351
- 1909 Jarvis, T. D. Ent. Soc. Ont. 39th Rep't, p. 76
- 1910 Stebbins, F. A. Springf. Mus. Nat. Hist. Bul. 2, p. 16.

The writer has found the gall of this species rather common on alders, *Alnus crispa*, in the vicinity of Albany, N. Y., and also at Davidson's River, N. C. It has been recorded by Dr J. B. Smith as common in New Jersey and is evidently abundant in and about Washington, D. C. The larvae enter the ground in late fall, the flies appearing the following April. Several parasites have been reared from galls of this midge, namely *Polymecus alnicola* Ashm., MS, *Polygnotus alnicola* Ashm., MS, *Anagrus spiritus* Gir. and *Torymus ostensackenii* D. T.

Gall. The gall is a subconic, deformed bud 6 to 12 mm in diameter. It is a variable greenish or pinkish and frequently with a distinct whitish bloom. The hollow interior contains several larvae, in some instances two types; a small, possibly young, whitish larva and a pale green or reddish larva with a distinct breastbone.

Male. Length 3.5 mm. Antennae shorter than the body, thickly haired, light brown; 18 segments, the fifth with a stem three-quarters the length of the cylindric basal enlargement, which latter has a length twice its diameter. Palpi; the first segment irregular, incrassate, the second with a length three times its diameter, the third a little longer, more slender, the fourth nearly twice the length of the third. Mesonotum dark brown, the submedian lines thickly haired. Scutellum reddish brown, postscutellum darker. Abdomen reddish brown, rather thickly clothed with fine hairs; genitalia dark brown. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Legs a nearly uniform light brown; claws long, strongly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment stout, truncate; terminal clasp segment long, nearly straight, slender; dorsal plate long, broad, deeply and triangularly emarginate; ventral plate long, deeply and triangularly emarginate. Harpes long, slender, irregularly truncate.

Female. Length 4 mm. Antennae extending to the fourth abdominal segment, rather thickly haired, light brown; 18 segments, the fifth cylindric, with a length twice its diameter; terminal segment reduced, narrowly oval. Ovipositor when extended nearly as long as the abdomen; terminal lobes narrowly oval, with a length nearly four times the width, sparsely setose. Other characters practically as in the opposite sex.

The megascopic characters were drafted from type specimens in the Museum of Comparative Zoology, the microscopic characters from specimens reared by Mr Pergande, April 30, 1884.

***Dasyneura toweri* Felt**

1909 **Felt, E. P.** Econ. Ent. Jour., 2:289

This species was reared September 16 and October 20, 1908 from enlarged flower buds of *Hypericum mutilum* taken by

Miss Cora H. Clarke at Magnolia, Mass. Galls from which midges had issued were also observed by her July 13, 1909.

Gall. The axillary flower buds of *Hypericum mutilum* are swollen, ovate, 5 mm long, 3 mm in diameter and greenish or reddish.

Egg. Length .15 mm, narrowly elliptical, probably reddish orange in color.

Larva. Length 2 mm, yellowish, moderately stout, the head broadly triangular. Antennae short, stout, acute. Breastbone wanting, segmentation distinct. Skin smooth, posterior extremity roundly truncate, the lateral angles with irregular groups of three or more rather stout, semitransparent processes; anus ovate.

Pupa. Length 2 mm. Mesonotum reddish brown. Scutellum and postscutellum fuscous yellowish. Abdomen mostly dull gray, the dorsal sclerites a variable fuscous anteriorly, with stout, closely set spines. Thoracic horns long, slender, acute. Antennal and leg cases yellowish gray, the latter extending to the acute tip of the abdomen. Wing cases dark gray.

Male. Length 2.5 mm. Antennae nearly as long as the body, sparsely haired, dark brown; 19 segments, the fifth with a stem one-quarter longer than the cylindric basal enlargement, which latter has a length twice its diameter; terminal segment reduced, narrowly oval. Palpi; first segment obconic, the second stout, sub-oval, the third a little longer, slender, the fourth one-half longer than the third, more slender. Genitalia; basal clasp segment long, slender; terminal clasp segment long, swollen near the middle; dorsal plate broad, deeply and triangularly emarginate, ventral plate broad, deeply and roundly emarginate. Harpes stout, truncate and irregularly tuberculate, broadly rounded. Other characters presumably as in the female.

Female. Length 2 mm. Antennae extending to the third abdominal segment, sparsely haired, dark brown; 19 cylindric sessile segments, the fifth with a length three times its diameter; terminal segment reduced, narrowly oval. Palpi; first segment short, stout, the second broadly oval, the third longer, more slender, the fourth twice the length of the third. Mesonotum shining dark brown. Scutellum dark reddish brown, postscutellum fuscous yellowish. Abdomen a variable reddish, the dorsal sclerites, especially basally, fuscous; terminal segment and ovipositor fuscous. Wings hyaline. costa dark brown. Halteres yellowish basally, fuscous apically. Legs a variable fuscous yellowish, the distal third of femora and the basal half of tibiae mostly fuscous; claws slender, strongly curved, the pulvilli as long as the claws. Ovipositor about one-third the length of the abdomen, the terminal lobe stout, with a length about four times its diameter, narrowly rounded. Type Cecid. a1883.

Lasiopteryx Westw.*Lepidomyia* Kieff.*Ledomyia* Kieff.

- 1840 **Westwood, J. O.** Introd. & Classif. of Ins., v. 2, suppl., p. 126
 1864 **Shiner, J. R.** Fauna Austriaca Dipt., 2:410 (*Diomyza* Shin.)
 1876 **Bergenstamm, J. E. & Low, Paul.** Syn. Cecidomyidarum, p. 24
 1877 **Karsch, F. A. F.** Revis. der Gallmücken, p. 14
 1894 **Kieffer, J. J.** Wien. Ent. Zeit., 13:201 (*Lepidomyia*)
 1895 ————— Soc. Ent. Fr. Bul. 64, p. 320 (*Ledomyia*)
 1897 ————— Syn. Cecid. Eur. & Alg., p. 55 (also *Ledomyia*)
 1900 ————— Soc. Ent. Fr. Ann., 69:443
 1901 ————— Soc. Hist. Nat. Metz. Bul., p. 17
 1904 ————— Soc. Sci. Brux. Ann. 28, pt 2. Sep., p. 2-7 (*Ledomyia*)
 1911 **Felt, E. P.** N. Y. Ent. Soc. Jour., 19:44

This genus is easily recognized by the fuscous or subhyaline wings, the membrane being more or less thickly scaled; the third vein well separated from the anterior margin and uniting with the thickly scaled costa near the distal fourth. Tarsi quinquearticulate, the first or metatarsus short; claws unidentate. Antennal segments cylindric, sessile in the female, those of the male with a distinct stem; circumfili present. Palpi quadriarticulate. Type *L. obfuscata* Meigen. Represented by five specimens in the British Museum, one of which was placed in a balsam mount by the writer.

A study of Westwood's type in the British Museum shows this to be a valid genus though hardly referable to the Heteropezinae on account of circumfili being present. Kieffer's *Ledomyia*, erected with *L. lugens* as the type, is in all probability a synonym of this genus, though on examination of the antennae in water under a cover glass, we were unable to detect circumfili. These latter are easily demonstrated in other species which Kieffer has referred to this genus.

One American species referred to *Lasiopteryx* differs from European forms studied, in the unusually stout and greatly developed circumfili. These organs in the male are irregular and the longer loops extend to the tip of stems as long as the basal enlargement of the antennal segment. Likewise, in the female the circumfili extend to the tip of the shorter stem. This group exhibits a relationship with the *Lasiopterariae* on account of the heavily scaled costa, while the well separated third vein and the stemmed antennae of the male indicate a close connection with the *Dasyneurariae*. Our best known form, *L. coryli* Felt, was reared from leaf folds of hazel, *Corylus americana*. It is interesting to note that its ally, *L. carpini* Felt, was taken on ironwood,

Carpinus americana, and may possibly be identical with *Cecidomyia pudibunda* O. S., the larvae of which live in the folds of beech leaves.

LASIOPTERYX

Key to species

- a* Antennae with 10 to 12 segments, the fifth of the male with a stem three-quarters the length of the basal enlargement, the ovipositor long
 - b* Abdomen yellowish red; female antennae with 10, male antennae with 11 segments, the ovipositor one-third the length of the abdomen
flavotibialis Felt, C. a1454
 - bb* Abdomen reddish brown; antennal segments 12, the ovipositor as long or longer than the abdomen.....*schwarzi* Felt, C. a2177
- aa* Antennae with 13 or 14 segments, the ovipositor short
 - b* Fifth antennal segment of the male with a stem one-half the length of the subcylindric basal enlargement
 - c* Wings broad, the fourth palpal segment one-half longer than the third
 - d* Antennae of the male half the length of the body, the fifth segment having the basal enlargement with a length twice its diameter, that of the female with a length two and one-half times its diameter.....
arizonensis n. sp., C. a2063
 - dd* Antennae of the male with a length nearly that of the body, the fifth having the basal enlargement with a length one-half greater than its diameter, that of the female with a length twice its diameter. Reared from Cassava.....
manihoti Felt.
 - cc* Wings narrow; female antennae slender, the fifth segment with a length three times its diameter, the fourth palpal segment one-quarter longer than the third.....*carpini* Felt, C. 346
- bb* Fifth antennal segment with a stem as long as the basal enlargement, circumfili greatly and irregularly produced in the male....
coryli Felt, C. a1543

Lasiopteryx flavotibialis Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 157-58 (*Dasyneura*)

1908 ——— N. Y. State Mus. Bul. 124, p. 341 (*Dasyneura*)

This striking and interesting form is at once recognized by the subhyaline and brilliantly iridescent wings, due to the numerous dark broad scales and the yellowish tibiae. The presence of well-developed circumfili prevent its reference to the *Heteropezinae*, while the distinctly petiolate antennae of the male prohibit its association with *Lasioptera*, despite the numerous scales occurring upon both wings and body. This species is easily distinguished by the 11 and 10 segments of the male and female respectively, in con-

nection with the strongly curved third vein. The adults reared May 7 and 8th, 1907 are very erratic in behavior, flying continuously perhaps for 10 minutes and then refusing to take wing. The pale salmon larvae were found in early May, under a hard, black, carbonaceous fungus overgrowing a decayed oak stump. The larvae were in cells and frequently folded so that the two extremities were approximate.

Larva. Length 3 mm, slender, color pale salmon. Head rather slender, with long, chitinous processes at the posterior lateral angles. Antennae uniarticulate, the segment with a length four times its diameter. Anterior margin of the first thoracic segment chitinized and supporting the subquadrate, slightly bidentate, chitinous process



Fig. 21 *Lasiapteryx flavotibialis*, ventral aspect of larval head (enlarged, original)

resembling a small breastbone, from the base of which arises a pair of long, diverging, chitinous prongs, all extending posteriorly (fig. 21); breastbone well developed, bidentate, the shaft long, slender. Skin nearly smooth. Posterior extremity broadly rounded, the median apical portion thickly set with short, stout spines.

Male. Length 1.25 mm. Antennae nearly as long as the body, thickly haired, fuscous yellowish; 11 segments, the fifth with a stem three-quarters the length of the basal enlargement, which latter has a length one-quarter greater than its diameter; terminal segment with the basal portion greatly produced, nearly one-half longer than that of the preceding, the distal part short, thickly setose. Palpi; fuscous yellowish, the first segment short, stout, subquadrate, the second one-half longer, the third about twice the length of the second, more slender, the fourth a little longer than the third. Face fuscous yellowish. Mesonotum fuscous, greenish

yellow, the submedian lines thickly clothed with long, fuscous hairs. Scutellum light reddish yellow with long setae apically, postscutellum yellowish. Abdomen dark yellowish red, thickly clothed with dark brown scales, the segments margined posteriorly with long, brown setae, the second to fifth segments with a pair of submedian, very small circular, orange spots near the distal third (these marks are visible only in favorable light and appear to be places where the black scales are missing). The sixth and seventh segments and genitalia fuscous yellowish; venter yellowish red, thickly clothed with dark brown scales, except a narrow mesial area. Wings subhyaline, brilliantly iridescent, costa black. Halteres whitish basally, black apically. Pleurae and coxae yellowish transparent, the latter with the anterior pair thickly clothed with long, black setae. Femora mostly dark brown or black, yellowish basally; tibiae nearly uniform yellowish; tarsi fuscous yellowish, the three distal

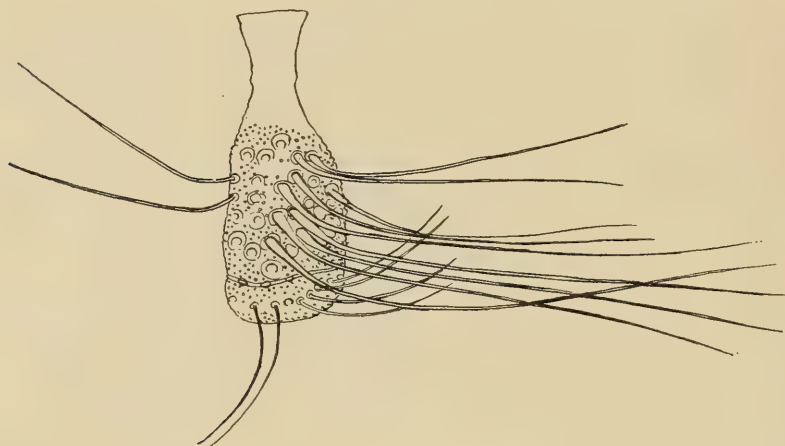


Fig. 22 *Lasiapteryx flavotibialis*, fourth antennal segment of male (enlarged, original)

segments black; claws long, slender, strongly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment short, stout; dorsal plate broad, broadly and deeply emarginate; ventral plate long, broad, truncate. Harpes long, tapering.

Female. Length 2 mm. Antennae extending to the second abdominal segment, sparsely haired, fuscous yellowish; 10 segments, the fifth sessile, cylindric, with a length fully twice its diameter; terminal segment greatly produced, tapering, obtuse. Mesonotum yellowish brown, the submedian lines thickly setose. Scutellum pale yellow, sparsely setose apically, postscutellum yellowish. Abdomen reddish salmon, uniformly clothed with dark brown scales, terminal segments and ovipositor yellowish. Tibiae yellowish basally, fuscous yellowish distally; tarsi dark fuscous yellowish, the distal segments black. Ovipositor one-third the length of the abdomen, the terminal lobes short, narrowly rounded. Type Cecid.

***Lasiopteryx schwarzi* Felt**

1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:191-92

Numerous midges were reared in the spring of 1911 from a dead wild fig branch collected by Mr E. A. Schwarz at Paraiso, Panama. It is easily separated from the preceding form by the larger number of antennal segments and marked differences in coloration.

***Lasiopteryx coryli* Felt**

1907 Felt, E. P. New species of Cecidomyiidae II, p. 11 (*Dasyneura*)

1908 ——— N. Y. State Mus. Bul. 124, p. 292, 342 (*Dasyneura*)

This species was reared July 11, 1907 from a fuzzy, wrinkled, fold gall at the base of hazel leaves taken at West Nyack, N. Y. The work of this insect was quite common in the vicinity and a number of adults were reared.

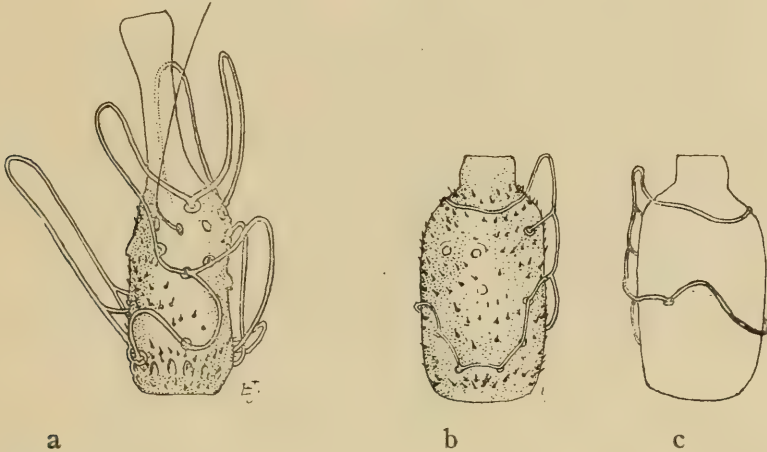


Fig. 23 *Lasiopteryx coryli*, 5th antennal segment, *a* male, *b* female, *c* reverse of *b* (enlarged, original)

Gall. The gall produced by this species occurs at the base of hazel leaves, *Corylus americana*, and consists of a series of radiating folds from the point of its attachment with the petiole. These folds rarely extend beyond the basal third of the leaf and form a series of deep, thickly haired wrinkles usually with the basal portions tinted with pink. The white larvae are 1 mm long.

Male. Length 1 mm. Antennae longer than the body, sparsely haired, dark brown or black, the basal segments pale yellowish; 14 segments, the fifth with a stem as long as the subcylindric basal enlargement, which latter has a length two and one-half times its diameter; terminal segment somewhat prolonged, tapering (fig. 22). Palpi; the first segment short, stout, subquadrate, the second short, rounded distally, the third with a length fully

twice that of the preceding segment, more slender, the fourth a little longer and more slender than the third, face yellowish. Head, thorax, abdomen, pleura, coxae and basal extremity of the femora all pale yellowish. Mesonotum dark brown, the narrow submedian lines yellowish, sparsely haired. Scutellum and postscutellum pale yellowish. Abdomen dark orange, very sparsely clothed dorsally with fuscous hairs; genitalia pale yellowish. Wings hyaline, costa dark brown, the wing margin and fringe unusually heavy. Halteres large, yellowish basally, fuscous subapically. Legs with the coxae and base of femora pale yellowish, darker apically, distal portion of femora and tibiae light fuscous, tarsi dark brown, claws very long, slender, strongly curved, the pulvilli one-half the length of the claws. Genitalia; basal clasp segment long, slender, terminal clasp segment swollen, long, slender; dorsal plate broad, broadly rounded, ventral plate shorter, broad, broadly and triangularly emarginate; harpes long, slender, tapering, obtuse.



Fig. 24 *Lasiopteryx coryli*, male genitalia (enlarged, original)

Female. Length .66 to 1 mm. Antennae not quite as long as the body, sparsely haired, pale yellowish; 14 segments, the fifth sessile, subcylindric, stem about one-quarter the length of the basal enlargement, which latter has a length two and one-fourth times its diameter; terminal segment produced, narrowly rounded apically. Palpi; the first and second segments presumably short, stout, the third with a length about two and one-half times its diameter, the fourth one-half longer than the third, more slender. Color a pale lemon yellow, the vestiture of the abdomen abundant enough to give some indication of banding. Halteres dark brown. Legs pale yellowish; the pulvilli apparently shorter than the claws. Ovipositor short, the terminal lobes short, stout, broadly rounded. Type Cecid. a1543.

***Lasiopteryx arizonensis* n. sp.**

The yellowish midge described below was reared April 21 and 24, 1911 from a jar containing wild grape leaves with numerous galls infested apparently by *Phylloxera* and collected August 15, 1910, by Dr R. E. Kunze at Prescott, Ariz. The very broad wings serve to distinguish this species from its near allies.

Male. Length .8 mm. Antennae extending to the fifth abdominal segment, thickly haired, dark reddish brown; probably 14 segments, the fifth having a stem one-half the length of the cylindric basal enlargement, which latter has a length twice its diameter; terminal segment missing. Palpi; first segment small, irregularly subfusiform, the second a little longer, subrectangular, the third a little shorter than the second, slightly swollen near the middle, the fourth fully one-half longer than the third, dilated apically. Mesonotum dark reddish brown, the submedian lines sparsely haired. Scutellum yellowish, postscutellum yellowish brown. Abdomen mostly fuscous yellowish, the dorsum of the segments sparsely clothed with fuscous hairs; genitalia fuscous. Wings subhyaline, unusually broad, the length being less than one-half greater than the diameter; costa thickly scaled. Halteres yellowish basally, fuscous apically. Coxae mostly pale yellowish; femora basally yellowish straw, slightly fuscous apically; tibiae and tarsi mostly dark brown or black and thickly scaled; claws slender, strongly curved, unidentate, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment slightly swollen basally, long; dorsal plate long, broad, deeply and triangularly emarginate; ventral plate rather long, broad, subtruncate. Halteres subtriangular, apically with a series of chitinized, digitate processes.

Female. Length .75 mm. Antennae hardly extending to the base of the abdomen, thickly haired, light brown, yellowish basally; 14 subsessile segments, the fifth cylindric, with a length about twice its diameter; terminal segment slightly produced, with a length two and one-half times its diameter, narrowly rounded apically. Palpi yellowish, the first segment irregularly subquadrate, the second narrowly oval, with a length about twice its diameter, the third as long as the second, slender, the fourth one-half longer than the second. Face yellowish. Mesonotum light brown, the submedian lines sparsely haired. Scutellum and postscutellum light orange yellow. Abdomen sparsely haired, dark orange yellow. Ovipositor short, the terminal lobes with a length one-quarter greater than the diameter, broadly rounded. Type Cecid. a2063.

***Lasiopteryx manihot* Felt**

1912 Felt, E. P. Can. Ent., 44:144

The small yellowish midges were reared from Cassava, *Manihot utilissima*, July 15, 1911, by W. H. Patterson, St Vincent, W. I.

***Lasiapteryx carpin* Felt**

1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 119. Separate, p. 23 (Asphondylia)

1908 ——— N. Y. State Mus. Bul. 124, p. 342 (*Dasyneura*)

This species was taken on ironwood or blue beech, *Carpinus americana*, at Albany, N. Y., June 21, 1906.

Female. Length .75 mm. Antennae extending to the middle of the abdomen, sparsely haired, dark brown, yellowish basally; 14 segments, the fifth cylindric, with a length two and one-half times its diameter, circumfili distinct, produced apically. Palpi; the first segment short, slightly expanded distally, second a little longer, the third suboval, a little longer than the second, the fourth more slender, elliptical and a little longer than the third. Face pale yellowish. Mesonotum fuscous orange with submedian lines yellowish, sparsely ornamented with fine setae. Scutellum pale yellowish with sparse apical setae, postscutellum fuscous yellow. Abdomen a pale fuscous orange, rather sparsely clothed with fuscous setae. Wings hyaline, costa dark brown; halteres pale yellowish. Legs fuscous, pale yellowish basally, tarsi slightly darker; claws slender, strongly curved. Ovipositor short, the lobes orbicular. Type Cecd. 346.

***Lasiapteryx crispata* Felt**

1914 **Felt, E. P.** Psyche 20:111

One female provisionally referred to this genus was reared August 22, 1912, from a jar containing oval, yellowish blister leaf galls on *Oakesia sessilifolia* collected by Miss Cora H. Clarke at Magnolia, Mass.

Arnoldia* Kieff.**Janetia* Kieff.**

1895 **Kieffer, J. J.** Wien Ent. Zeit., 14:7

1896 ——— Soc. Ent. Fr. Bul. 65, p. 236 (*Janetia*)

1897 ——— Syn. Cecd. Eur. & Alg., p. 15

1910 **Rübsaamen, E. H.** Zeitsch. Wissenschaft. Insektenbiol., 15:337

1911 **Felt, E. P.** N. Y. Ent. Soc. Jour., 19:44

Members of this genus may be recognized by the quadriarticulate palpi, the 12 to 13 sessile antennal segments and the nearly straight third vein uniting with costa near the wing apex. The two latter characters serve to separate it from the American *Neuromyia*. The basal clasp segment of the male genitalia is not greatly dilated as in *Macrolabis*. The female has a slender, tapering ovipositor about as long as the abdomen. The type is *Cecidomyia quercus* Binn. *Arnoldia gemmarum* Rubs. produces a smaller, flattened, woolly gall on oak than does *Dryomyia circinans* Giraud. Balsam mounts of the type, prepared by Professor Rübsaamen were studied by the author in the Museum of Natural History at Berlin. No American forms have been recognized.

Neuromyia Felt

1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:44

This genus is erected for the reception of several small forms erroneously referred at the outset to *Arnoldia*. These insects resemble, in a general way, *Rhizomyia* and may be readily separated therefrom by the strongly curved third vein uniting with costa at the distal fourth, the 4 or 5 segments of the palpi and the relatively short terminal clasp segment of the male genitalia. Members of this genus are distinguished from *Macrolabis* Kieff. by the basal clasp segment not being greatly enlarged and from *Arnoldia* Kieff. by the stemmed antennal segments of the male. Type *N. minor* Felt, erroneously referred to Kieffer's genus *Arnoldia*.

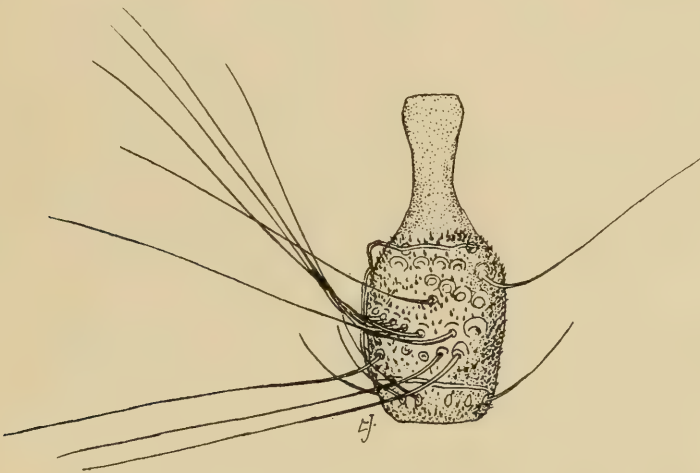


Fig. 25 *Neuromyia minor*, fifth antennal segment of male (enlarged, original)

Neuromyia minor Felt

1907 Felt, E. P. New Species of Cecidomyiidae II, p. 9 (*Arnoldia*)

1908 ——— N. Y. State Mus. Bul. 124, p. 290, 340 (*Arnoldia*)

1911 ——— N. Y. Ent. Soc. Jour., 19:44

Several specimens of this dark brown species, only .75 mm in length, were taken on a window at Nassau, N. Y., July 1, 1906. It is the only known representative of the genus.

Male. Length .75 mm. Antennae extending almost to the tip of the abdomen, rather thickly haired, dark brown, fuscous basally; 12 segments, the fifth with a stem as long as the basal enlargement, which latter has a length three times its diameter; terminal segment slightly prolonged, slender, fusiform, obtuse distally. Palpi; the first segment rather stout, subquadrate, the second stouter, nar-

rowly oval, the third one-half longer, more slender, the fourth a little longer than the third, more attenuate, face fuscous. Mesonotum dark brown, submedian lines indistinct. Scutellum dark brown, yellowish orange basally, postscutellum dark brown. Abdomen a uniform dark brown. Wings subhyaline, costa thickly clothed with dark brown scales, subcosta uniting with the margin at the basal third, the third vein at the distal sixth, the fifth vein joining the posterior margin at the distal fourth, its branch at the basal third, subcosta and the base of the third and fifth veins rather thickly clothed with scales; halteres yellowish transparent. Coxae pale orange, femora and tibiae pale yellowish, distally with narrow reddish or brownish bands, tarsi dark brown; claws rather long, stout, evenly curved, the anterior unidentate. Genitalia; basal clasp segment long, stout; terminal clasp segment short, stout, swollen basally. Dorsal plate broad, deeply and triangularly incised. Harpes long, slender and irregularly truncate. Type Cecid. 431.

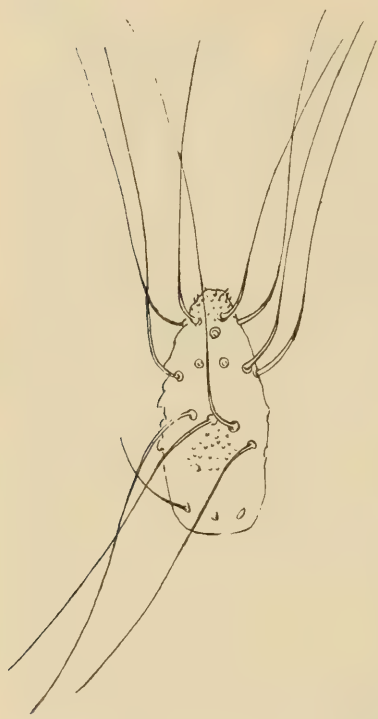


Fig. 26 *Neuromyia minor*, terminal antennal segment of male (enlarged, original)

Dryomyia Kieff.

1897 Kieffer, J. J. Syn. Cecid. Eur. & Alg., p. 17

1910 Rübsaamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:337

1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:44

It is relatively easy to separate this genus from other genera of the Dasyneuriariae by the triarticulate palpi and the 18 to 20 antennal segments, in connection with the normal male genitalia. The type species is *D. circinans* Giraud. The male has 20 antennal segments, the fifth with a stem as long as the basal enlargement, which latter has a length one-half greater than its diameter. The palpi are triarticulate and the claws long and slender. Basal clasp segment stout, the terminal clasp segment stout, tapering; dorsal plate short, broad, triangularly emarginate, the lobes diverging, truncate; ventral plate long, divided, the lobes long, tapering, setose. The female has 20 sessile antennal segments, the fifth with a length

thrice its diameter. The ovipositor is probably as long as the body. This species produces a woolly, brownish, spheroid gall on *Quercus* leaves, resembling somewhat a *Caryomyia* gall on hickory. The above is drafted from microscopical preparations prepared by Professor Rubsaamen and in the Natural History Museum at Berlin. One American species is known.

Dryomyia folliculi Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 348 (as *Dasyneura*)

1909 ———— Ottawa Nat., 22:247 (as *Dasyneura*)

This species was reared July 26, 1907 from a loose pod composed of the adherent terminal leaves of *Solidago canadensis* containing a number of Cecidomyiid larvae. This gall was taken by Mr L. H. Joutel at Jamesburgh, N. J., July 15, 1907. The pupa, before the adult emerges, escapes from the cocoon, leaving the exuviae lying beside the latter.

Gall. The gall made by this species is a loose, slightly swollen pod composed of the adherent terminal leaves of *Solidago canadensis*. It contains a number of yellowish larvae.

Cocoon. The cocoon is about 1.5 mm long, .75 mm in diameter and whitish.

Female. Length 1.25 mm. Antennae apparently extending to the third abdominal segment, sparsely haired, reddish brown; 15 segments, the first broadly obconic, the second flattened basally, subhemispheric, the third and fourth narrowly fused, the fifth sessile, with a length nearly three times its diameter, a sparse subbasal whorl of short, curved setae and a broad subapical band of longer, rather stout setae; terminal segment evidently composed of two rather closely fused segments, the division being nearer the distal

third. Palpi; the first segment short, stout, irregular, the second irregularly oval, stout, the third slender, greatly produced, being three times the length of the second. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum fuscous orange, postscutellum darker. Abdomen dark red, the incisures and pleurae deep carmine. Wings hyaline, costa dark brown, subcosta uniting therewith at the basal third, the third vein well be-

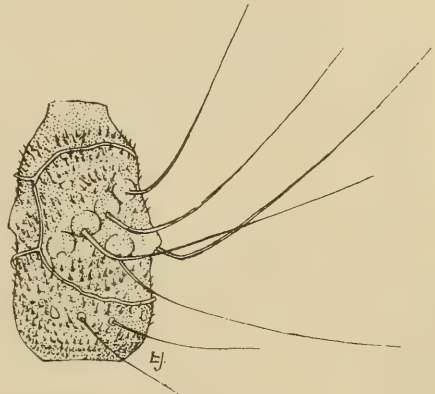


Fig. 27 *Dryomyia folliculi*, fifth antennal segment of female (enlarged, original)

fore the apex, the fifth joining the posterior margin at the distal third, its branch at the basal third. Halteres yellowish basally, fuscous apically. Coxae and base of femora pale yellowish, the distal portion of femora and tibiae dark brown; tarsi apparently yellowish, the distal segments variably tinged with carmine. Claws rather long, stout, slightly curved, with a long, slender tooth basally; pulvilli longer than the claws. Ovipositor nearly as long as the abdomen, the terminal lobes long, narrowly oval. Type Cecid. a1581.

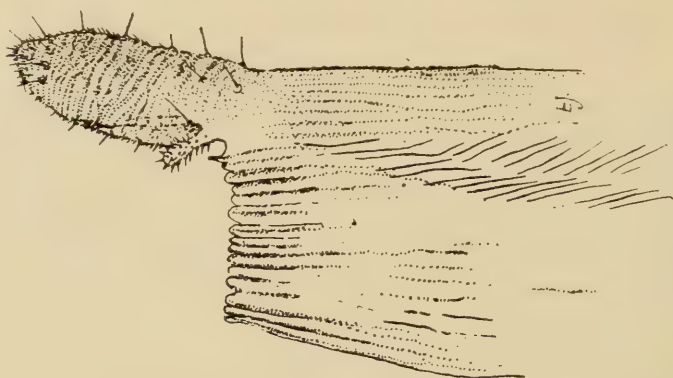


Fig. 28 *Dryomyia folliculi*, tip of ovipositor
(enlarged, original)

Cystiphora Kieff.

- 1892 Kieffer, J. J. Wien Ent. Zeit., 11:212-14
 1895 ———— Wien Ent. Zeit., 14:8-9
 1897 ———— Syn. Cecid. de Eur. & Alg., p. 18
 1910 Rübsaamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:337
 1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:44

This genus may be recognized by the 13 or 14 antennal segments, there being a distinct tendency toward reduction and fusion with the preceding in the case of the fourteenth segment. The male antennae have the stem fully as long as the basal enlargement, which latter is cylindric and presents much the same characters as obtained in *Rhabdophaga*. The female antennal segments are cylindric, sessile or subsessile and approach those of the female *Rhabdophaga*. The palpi are triarticulate. The wings are small, with the third vein nearly straight and uniting with the anterior margin distinctly before the apex, the general appearance of these organs being very close to that of *Dasyneura*, though the third vein is not quite so heavy. The claws are minutely unidentate in both sexes. The male genitalia present strong affinities with those of *Rhabdophaga*. The ovipositor is unique, having a broad, stout,

retractile portion and a much more slender, presumably chitinized apical part.

This genus presents greater affinities with the *Dasyneura* group than with the *Asphondyliid* group, and we have consequently included it in the former, despite the peculiar structure of the female ovipositor. This latter organ differs, we believe, widely from that of the typical *Asphondylia*, and as the antennae present no homologies therewith, we see no other alternative than to make the change. Type *C. pilosellae* Kieff.

***Cystiphora viburnifolia* Felt**

1911 Felt, E. P. Econ. Ent. Jour., 4:480-81

Only one female was reared May 5, 1909, from an inconspicuous elevation on the underside of the leaf of a hobblebush, *Viburnum lentago*, taken by Miss Cora H. Clarke at Magnolia, Mass., the preceding fall. This gall appears to be very common about Albany, N. Y. The small yellowish midge presents a close, superficial resemblance to *Sackenomyia viburnifolia* Felt, though it may be easily separated therefrom by the distinctly unidentate claws. The structure of the ovipositor does not agree exactly with that of the European *Cystiphora* and the species is therefore provisionally referred to this genus subject to further study.



Fig. 29 *Cystiphora viburnifolia*, tip of abdomen (enlarged, original)

Gall. This is a minute, scarcely noticeable elevation, the larvae evidently lying between the upper and lower epidermis and producing a very slight swelling. (Pl. 8, fig. 3.)

Larva. Length 1.5 mm, whitish. Head small. Antennae rather long, tapering; breastbone, stout, bidentate, becoming obsolescent posteriorly. Skin coarsely shagreened; posterior extremity broadly rounded.

***Cystiphora canadensis* Felt**

1913 Felt, E. P. Canad. Ent., 40:417

1914 Cosens, A. Canad. Ent., 41:180.

This midge was reared from a blister leaf gall on white lettuce or rattlesnake root, *Prenanthes altissima* or *P. alba*.

Rhizomyia Kieff.

1897 **Kieffer, J. J.** Syn. Cecid. Eur. & Alg., p. 56-57

1899 **Rübsaamen, E. H.** Biolog. Centralbl., 19:534 (Coccomorpha)

1904 **Kieffer, J. J.** Soc. Sci. Brux. Ann., v. 28, pt 2 Separate, p. 7

1910 **Rübsaamen, E. H.** Zeitschr. Wissenschaftl. Insektenbiol., 6:200-02

1911 **Felt, E. P.** N. Y. Ent. Soc. Jour., 19:44

This genus is easily distinguished from all other Dasyneuriariae by the triarticulate palpi and the 12 antennal segments, those of the female subsessile, while in the male the stem is nearly as long as the basal enlargement. The terminal clasp segment of the male is very long, slender, and the ovipositor short and lobed. The type of this genus is *R. perplexa* Kieff.

A number of American species, closely allied to, if not cogenetic with, the European forms, have been tentatively referred to this genus. It is possible that further studies will warrant the placing of our American species in a separate genus. Two of the European species have been reared from the leaf sheath and roots of sedge, while our American species were obtained from jars containing various characteristic galls. The conditions were such as to lead us to suspect that the rearings were accidental.

The peculiar larva of *R. circumspinosus* Ruls. is oval, flattened and resembles a Coccid, hence its generic designation of Coccomorpha. This larva was found under the sheath of *Carex* leaves, while that of *R. perplexa* Kieff. occurred upon the roots of a sedge.

Key to species*Males*

a Stem of fifth antennal segment one-quarter longer than the basal enlargement

b Abdomen light yellowish or yellowish orange; tibiae fuscous straw, tarsi dark brown or black, basal enlargement of fifth antennal segment with a length twice its diameter, the ventral plate roundly emarginate, the dorsal plate short, deeply and narrowly emarginate. Reared from rolled ash leaves.....

fraxinifolia Felt, C. 21572a

bb Abdomen fuscous yellowish, the segments margined posteriorly with dark brown, basal enlargement of fifth antennal segment with a length twice its diameter, the ventral plate very deeply and roundly emarginate.....

cincta n. sp., C. 722

bbb Abdomen pale orange, basal enlargement of fifth antennal segment with a length twice its diameter, the ventral plate broadly and roundly emarginate, the dorsal plate very short, deeply and roundly emarginate.....

ungulata Felt, C. 1221

- bbbb* Abdomen dark yellowish fuscous, basal enlargement of fifth antennal segment with a length twice its diameter, the ventral plate roundly emarginate, the dorsal plate long, broad and roundly emarginate.....*cerasi* Felt, C. 343
- bbbbb* Abdomen pale brown, the basal enlargement of the fifth antennal segment with a length three times its diameter, the ventral plate slightly emarginate, the dorsal plate triangularly emarginate.....
hispida Felt, C. 519
- aa* Stem of fifth antennal segment as long as the basal enlargement
- b* Abdomen yellowish brown, the basal enlargement of the fifth antennal segment with a length twice its diameter, the ventral plate broadly emarginate.....*vitis* Felt, C. a1165a
- bb* Abdomen reddish yellow, tibiae and tarsi dark brown, the basal enlargement of the fifth antennal segment with a length two and one-half times its diameter, the ventral plate roundly and the dorsal plate triangularly emarginate.....
absobrina Felt, C. a1555x

Females

- c* Abdomen pale yellowish, fifth antennal segment with a length about three times its diameter, the lobes of the ovipositor broadly rounded apically.....*absobrina* Felt, C. a1555x, a1518, a1579
- aa* Abdomen reddish yellow, the fifth antennal segment with a length three times its diameter, the lobes of the ovipositor subtriangular.....
hirta Felt, C. a1576a
- aaa* Abdomen light fuscous yellowish, fifth antennal segment with a length about two and one-half times its diameter, with the lobes of the ovipositor broadly ovate.....*vitis* Felt, C. a1165a, a1568b

Rhizomyia fraxinifolia Felt

- 1907 **Felt, E. P.** New species Cecidomyiidae II, p. 8 (Arnoldia)
- 1908 ——— N. Y. State Mus. Bul. 124, p. 289, 384 (Arnoldia)

This light yellowish species was reared July 25, 1907 from a jar containing leaves of ash, *Fraxinus*, badly rolled by small, whitish larvae and collected by Mr L. H. Joutel at Newfoundland, N. J.

Male. Length 1 mm. Antennae as long as the body, sparsely haired, dark brown, yellowish basally; 12 segments, the fifth with a stem as long as the basal enlargement, which latter has a length nearly twice its diameter. Palpi; the first segment subquadrate, the second more than twice the length of the first, more slender, the third a little longer and more slender than the second. Face fuscous yellowish. Mesonotum light brown, the submedian lines indistinct. Scutellum, postscutellum and abdomen a nearly uniform light yellowish or yellowish orange, the last sparsely fuscous haired dorsally. Genitalia light fuscous. Wings hyaline, costa dark brown. Halteres yellowish basally, light fuscous apically. Coxae

and femora pale yellowish; tibiae light fuscous straw; tarsi dark brown, almost black; claws long, slender, strongly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment short, stout; terminal clasp segment long, stout at base; dorsal plate short, stout, deeply and triangularly emarginate; ventral plate long, stout, broadly and roundly emarginate. Type Cecid. a1572a.

Rhizomyia cincta n. sp.

This fuscous yellowish species was taken on *Cornus*, probably *C. stolonifera* at Albany, N. Y., July 30, 1906.

Male. Length 2 mm. Antennae nearly as long as the body, sparsely haired, dark brown; 12 segments, the fifth with a stem one-quarter longer than the basal enlargement, which latter has a length twice its diameter; terminal segment produced, with a length four times its diameter, tapering distally. Palpi; first segment broadly oval, the second slender, with a length four times its diameter, the third one-half longer, slender. Mesonotum dark brown, the submedian lines yellowish. Scutellum yellowish, reddish apically, postscutellum fuscous yellowish. Abdomen dark fuscous yellowish, the basal segment dark brown, the others margined posteriorly with dark brown and thickly clothed with fuscous hairs, the venter yellowish; genitalia brownish yellow. Wings hyaline, costa dark brown. Halteres pale yellowish. Coxae and femora basally yellowish, the remainder of the legs mostly dark brown; claws long, strongly curved, slender, the pulvilli much shorter than the claws. Genitalia; basal clasp segment stout, truncate; terminal clasp segment long, slender; dorsal plate short, deeply and triangularly emarginate; ventral plate long, broad, deeply and roundly emarginate; harpes long, slender. Type Cecid. 722.

Rhizomyia ungulata Felt

1907 **Felt, E. P.** New Species Cecidomyiidae II, p. 9 (Arnoldia)

1908 ——— N. Y. State Mus. Bul. 124, p. 290, 340 (Arnoldia)

This pale orange midge was taken at Albany, N. Y., July 6, 1907.

Male. Length 1 mm. Antennae a little longer than the body, thickly haired, light brown, yellowish basally; 12 segments, the fifth with a stem about one-quarter the length of the basal enlargement, which latter has a length one-half greater than its diameter; terminal segment produced, subcylindric, subacute. Palpi; the first segment short, stout, the second irregularly subquadrate, the third long, stout, with a length about thrice its diameter. Face pale yellowish. Mesonotum dark brown, the orange, submedian lines sparsely haired. Scutellum pale reddish, postscutellum pale orange. Abdomen sparsely haired, pale orange. Genitalia slightly fuscous. Wings hyaline, costa dark brown. Halteres yellowish

basally, fuscous apically. Legs a variable fuscous straw, the tarsi slightly darker; claws very long, slender, strongly curved near the base, the pulvilli shorter than the claws. Genitalia; basal clasp segment short, stout; terminal clasp segment long, stout; dorsal plate very short, broadly and roundly emarginate; ventral plate long, the sides parallel, slightly constricted near the basal third and expanded subapically, broadly and roundly emarginate. Type Cecid. 1221.

***Rhizomyia cerasi* Felt**

1907 **Felt, E. P.** N. Y. State Mus. Bul. 110, p. 114 (*Dasyneura*)

1908 ——— N. Y. State Mus. Bul. 124, p. 340 (*Arnoldia*)

This fuscous species was taken presumably on black cherry, *Prunus serotina*, at Albany, N. Y., June 21, 1906.

Male. Length 1 mm. Antennae probably one-half longer than the body, thickly setose, dark brown, yellowish basally; 12 segments, the fifth with a stem one-quarter longer than the basal enlargement, which latter has a length twice its diameter. Palpi; the first segment swollen, subquadrate, the second and third subequal, each fully twice the length of the first. Face fuscous yellowish. Mesonotum dark brown, the submedian lines pale yellowish and sparsely setose. Scutellum pale yellowish, sparsely setose apically, postscutellum fuscous yellowish. Abdomen dark fuscous yellowish, lighter basally, sparsely clothed with pale yellowish hairs. Wings hyaline. Halteres yellowish transparent. Legs pale straw, tarsi darker. Genitalia; basal clasp segment stout, a conspicuous internal tooth at the basal third; terminal clasp segment swollen basally, long, slender; dorsal plate long, broadly and slightly emarginate; ventral plate long, broadly Y-shaped. Type Cecid. 343.

***Rhizomyia hispida* Felt**

1907 **Felt, E. P.** New Species Cecidomyiidae II, p. 9 (*Arnoldia*)

1908 ——— N. Y. State Mus. Bul. 124, p. 290, 340 (*Arnoldia*)

This pale brown midge was taken on Cornus, probably *C. stolonifera*, at Albany, N. Y., July 6, 1906.

Male. Length 1 mm. Antennae longer than the body, thickly haired, dark brown, fuscous basally; 12 segments, the fifth with a stem one-quarter longer than the basal enlargement, which latter has a length thrice its diameter; terminal segment produced, subcylindric, obtuse. Palpi; the first segment short, subquadrate, the second twice the length of the first, irregular, the third a little longer and more slender than the second. Mesonotum dark brown, submedian lines yellowish. Scutellum yellowish orange, postscutellum yellowish. Abdomen pale brown, thickly setose. Wings hyaline, costa dark brown. Halteres yellowish basally, whitish apically. Coxae, femora and tibiae mostly pale yellowish, tarsi

light brown, the terminal segments darker; claws long, slender, strongly curved. Genitalia; basal and terminal clasp segments stout; dorsal plate broad, deeply and triangularly emarginate; ventral plate broad, long, slightly emarginate. Type Cecid. 519.

Rhizomyia vitis Felt

1907 **Felt, E. P.** New Species Cecidomyiidae II, p. 9-10 (Arnoldia)

1908 ——— N. Y. State Mus. Bul. 124, p. 290-91, 341 (Arnoldia)

This species was reared at Albany, N. Y., July 13, 1907 from a jar containing the familiar tumid gall of *Lasioptera vitis* O. S. on grape, *Vitis* species. It was also obtained from a jar in which were adherent leaf galls on *Solidago* inhabited by *Camponeuromyia adhesa* Felt and *Asphondylia monacha* O. S.

Male. Length 1 mm. Antennae nearly as long as the body, thickly haired, fuscous yellowish, yellowish basally; 12 segments, the fifth with a stem as long as the basal enlargement, which latter has a length twice its diameter; terminal segment produced, tapering, narrowly rounded. Palpi; the first segment long, subquadrate, the second stouter, narrowly oval, the third one-half longer than the second, more slender. Mesonotum and dorsum of abdomen yellowish brown. Scutellum, postscutellum, parities and incisures pale yellowish. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Legs yellowish basally, dark brown distally; claws long, slender, strongly curved, the pulvilli shorter than the claws. Genitalia; basal and terminal clasp segments stout; dorsal plate long, narrow, broadly and roundly emarginate; ventral plate short, stout, narrowly rounded.

Female. Length 1.5 mm. Antennae extending to the third abdominal segment, rather thickly haired, dark brown, yellowish basally; 12 segments, the fifth subsessile, cylindric, with a length two and one-half times its diameter; terminal segment produced, narrowly rounded. Mesonotum dark brown, the submedian lines yellowish. Scutellum and postscutellum yellowish. Abdomen light fuscous yellowish, the incisures, pleurae and venter pale yellowish. Ovipositor short, the terminal lobes broadly oval, otherwise nearly as in the male. Type Cecid. a11165a.

Rhizomyia absobrina Felt

1907 **Felt, E. P.** New Species Cecidomyiidae II, p. 8 (Arnoldia)

1908 ——— N. Y. State Mus. Bul. 124, p. 289, 340 (Arnoldia)

This species was reared at Albany, N. Y., July 11th and 26th, 1906 from a jar containing *Crataegus* leaves bearing green, sub-

cylindric, fimbriate, unicellular galls. Apparently the same form was obtained from a jar containing subglobular poplar leaf galls, and from another stocked with distorted cherries, produced by *Dasyneura virginiana* Felt. It is possibly an inquiline.

Male. Length 1.25 mm. Antennae nearly as long as the body, thickly haired, dark brown; 12 segments, the fifth with a stem as long as the basal enlargement, which latter has a length two and one-half times its diameter; terminal segment produced, tapering, obtuse. Palpi; the first segment short, stout, subquadrate, the second twice the length of the first, more slender, the third one-half longer than the second, expanded. Head, mesonotum, abdomen, coxae and pleurae all reddish yellow, the mesonotum with sub-lateral, slightly brownish areas, the abdomen sparsely clothed dorsally with dark hairs. Wings hyaline, costa dark brown. Halteres yellowish transparent, fuscous sub-

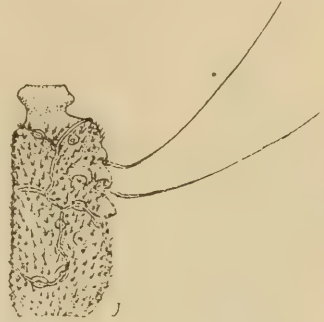


Fig. 30 *Rhizomyia absobrina*, fifth antennal segment of female (enlarged, original)

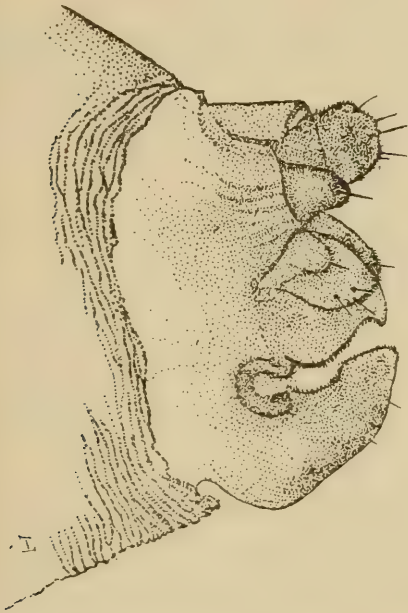


Fig. 31 *Rhizomyia absobrina*, tip of abdomen showing ovipositor (enlarged, original)

apically. Legs with the coxae and femora pale yellowish, the latter darker distally; tibiae and tarsi dark brown; claws long, slender, strongly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment short, stout; terminal clasp segment long, stout at base; dorsal plate short, broad, deeply and triangularly incised; ventral plate long, broadly and roundly emarginate.

Female. Length 1 mm. Antennae extending to the third abdominal segment, sparsely haired, dark brown, yellowish basally; 12 segments, the fifth subsessile, cylindric, with a length thrice its diameter; terminal segment produced, narrowly rounded. Palpi probably triarticulate. Face yellowish. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum pale orange, post-scutellum pale yellowish. Abdomen rather thickly clothed with fuscous hairs, pale yellowish. Ovipositor short, the terminal lobes short, stout, broadly rounded, otherwise nearly as in the male

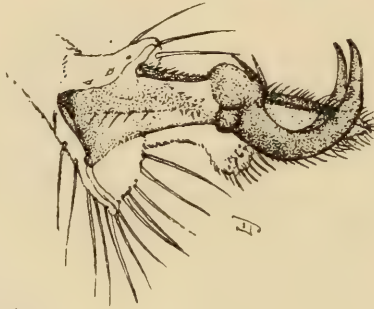
Type Cecid. a1555x.

Rhizomyia hirta Felt1911 **Felt, E. P.** Econ. Ent. Jour., 4:478

This species was reared August 17, 1907 from a jar containing numerous reddish, blisterlike leaf mines on *Crataegus* collected at Bath, N. Y.



a



b

Fig. 32 *Diarthronomyia artemisiae*, *a* male palpus, *b* side view of claw (enlarged, original)

July 9. This gall is presumably made by *Lasioptera excavata* though this habit is abnormal for the genus. The light fuscous yellowish female may be distinguished by the fifth antennal segment having a length two and one-half times its diameter and by the broadly ovate lobes of the ovipositor.

Larva. Length 2 mm, rather stout, pale yellowish. Head rather broad; antennae short, stout; breastbone slightly expanded apically, obtusely bidentate, subobsolete posteriorly. Skin smooth, posterior extremity broadly rounded, with sublateral, irregular groups of papillae. The larva is doubtfully referred to this species.

Ctenodactylomyia Felt, MS

This peculiar genus is easily distinguished from *Rhizomyia* by the larger number of antennal segments and, in particular, by the pectinate claws. The one known species, *C. watsoni* Felt, MS was reared from circular blister-like leaf galls on *Coccolobis floridana*.

Diarthronomyia Felt1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 3391910 **Rübsaamen, E. H.** Zeitschr. Wissenschaftl. Insektenbiol. 15:3371911 **Felt, E. P.** N. Y. Ent. Soc. Jour., 19:45

This genus presents a general resemblance to *Rhopalomyia* in its biarticulate palpi and the great similarity in the structure of the male genitalia. The minutely unidentate claws associate it with *Rhabdophaga* and its allies. The type species is *D. artemisiae* Felt.

***Diarthronomyia californica* Felt**

1912 **Felt, E. P.** Pomona Coll. Jour. Ent., 4:752

The midge was reared from subconic leaf galls on *Artemisia californica*, Claremont, Cal.

***Diarthronomyia artemisiae* Felt**

1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 339-40

The species described below was reared June 16, 1883 from galls on sage bush, *Artemisia tridentata*, collected by Lawrence Bruner at Fort Garland, Col. This species approaches *Rhopalomyia tridentatae* Rubs. though it differs therefrom in the greater number of antennal segments, the longer stems

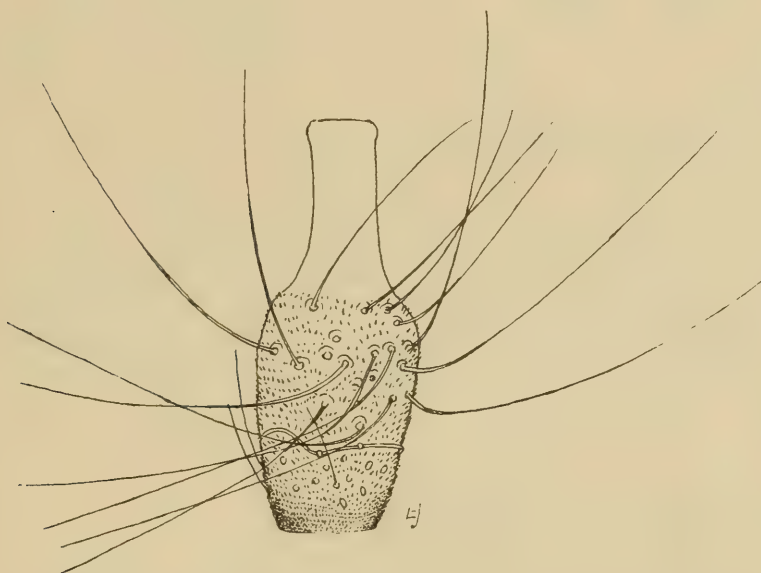


Fig. 33 *Diarthronomyia artemisiae*, fifth antennal segment, male (enlarged, original)

in the male flagellate segments and in the absence of what might be termed three whorls of hairs. There appears to be no description of the gall.

Male. Length 2 mm. Antennae nearly as long as the body, thickly haired, yellowish brown; 18 segments, the fifth with a stem about three-quarters the length of the subcylindric basal enlargement, which latter has a length twice its diameter; terminal segment greatly produced, with a length about four times its diameter, narrowly rounded apically. Palpi; first segment prolonged, swollen distally, with a length twice its diameter, the second short, stout, narrowly rounded apically. Mesonotum dark reddish brown, the

submedian lines sparsely haired. Scutellum reddish brown; post-scutellum darker. Abdomen sparsely haired, reddish brown. Wings hyaline, costa pale yellowish, subcosta uniting with the anterior margin near the basal half, the nearly straight third vein at the apex, the fifth, indistinct distally, at the distal fourth, its branch near the basal half. Halteres yellowish transparent. Legs a variable light straw, lighter distally; claws long, stout, strongly curved, unidentate, the pulvilli as long as the claws. Genitalia; basal clasp segment long, broad; terminal clasp segment short, stout, swollen near the basal third, apically with a heavy tooth; dorsal plate short, broad, deeply and triangularly incised, the lobes broadly rounded; ventral plate long, narrow, deeply and narrowly incised. Harpes short, stout, tapering, truncate.

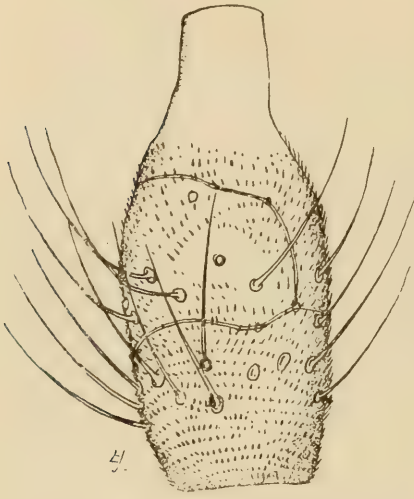


Fig. 34 *Diarthronomyia artemisiae*, fifth antennal segment of female (enlarged, original)

Female. Length 3 mm. Antennae extending to the third abdominal segment, sparsely haired, pale yellowish; probably 18 segments, the fifth with a stem one-third the length of the subcylindric basal enlargement, which latter has a length fully two and one-half times its diameter. Palpi; first segment stout, swollen distally, the second a little longer, narrowly oval. Color characters as in the male. Type Cécid. 989.

Coccidomyia Felt

1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:45

This genus was erected for a unique species evidently bred from young *Lecanium* scales. It may be separated from all other Itonididae known to us by the 12 antennal segments, those of the male being stemmed, in connection with the two palpal segments, the second being minute. The claws are toothed and the third vein unites with the margin at or very near the apex. Type *C. pennsylvanica* Felt.

Coccidomyia pennsylvanica Felt

1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:45

This interesting form was received from Mr W. S. Fisher of Highspire, Pa., through the United States Bureau of Entomology and sent by Mr Fisher under date of May 8th. The sole material

received at that time consisted of a beech leaf, probably *Fagus grandifolia*, the under side of which was apparently rather thickly infested with young *Lecanium* scales and the upper side sparingly so. Dipterous exuviae were projecting from under the scales. Later additional material was received from which satisfactory microscopic preparations were made.

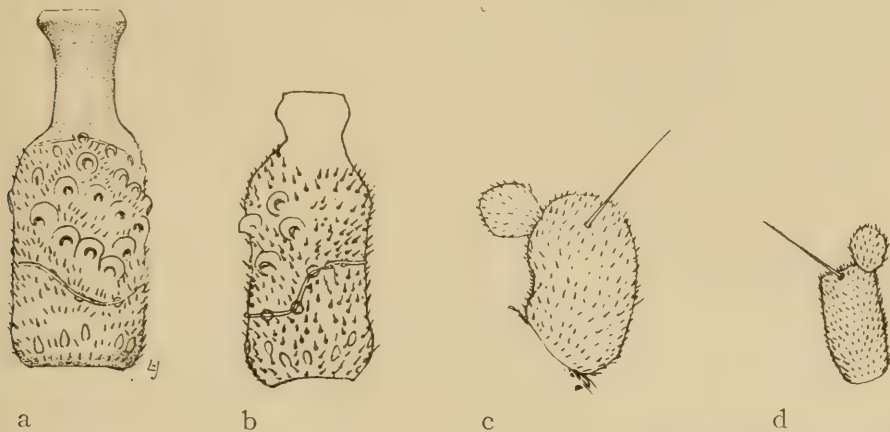


Fig. 35 *Coccidomyia pennsylvanica*, fifth antennal segment, *a* male, *b* female; palpus, *c* male, *d* female (enlarged, original)

Coccidomyia erii Felt

1912 Felt, E. P. N. Y. Ent. Soc. Jour., 20:147

The midges were reared by P. H. Timberlake from *Artemisia californica* infested by *Erium lichtensioides* collected in Ventura county, Cal.



Fig. 36 *Coccidomyia pennsylvanica*, tip of abdomen showing ovipositor (enlarged, original)

Procystiphora n. g.

The genus has the general appearance of Rhabdophaga and is most easily separated therefrom by the apical chitinized blade of the long ovipositor and the simple or nearly simple claws of this sex. The claws of the male are weakly dentate and the harpes only slightly chitinized. This form approaches Cystiphora in the reduced teeth of the claws and the chitinized apex of the ovipositor, though it is easily distinguished from this genus by the quadriarticulate palpi and the larger number of antennal segments. Type *P. coloradensis* n. sp.

***Procystiphora coloradensis* n. sp.**

Described from two males and one female collected by Prof. T. D. A. Cockerell at Long's Peak Inn, Colorado, in the Canadian Zone, July 21, 1914 and thought by him to have possibly come from *Carex*, though the appearance of the midge suggests to the writer that it may be an inhabitant of willow.

Male. Length 2.5 mm. Antennae nearly as long as the body, sparsely haired, dark brown; 18 segments, the fifth with a stem one-fourth longer than the basal enlargement, which latter has a length three-fourths greater than its diameter, a moderately thick subbasal whorl of short, stout setae and a thick subapical band of longer setae; low circumfili occur at the basal third and apically; terminal segment broadly oval, with a length about one-fourth greater than its diameter, the apex broadly rounded. Palpi; first segment irregular, subquadrate, the second with a length two and one-half times its diameter, the third a little longer than the second, slender, the fourth one-fourth longer than the third. Mesonotum shining dark brown. Scutellum dark yellowish brown, postscutellum fuscous yellowish. Abdomen a variable dark reddish brown. Wings hyaline, costa fuscous straw, the third vein uniting with the margin at the apex of the wing, the fifth forked. Halteres fuscous yellowish, darker apically. Coxae and legs a variable yellowish brown, the claws minutely dentate, pulvilli distinctly longer than the claws. Genitalia; basal clasp segment long, rather slender; terminal clasp segment long, stout, with a distinct apical spur; dorsal plate long, broad, divided, the lobes long and narrowly rounded; ventral plate long, broad, deeply and roundly emarginate, the lobes narrow; harpes moderately long, expanded, roundly truncate and slightly chitinized apically; style short, swollen basally, broadly rounded apically.

Female. Length 2 mm. Antennae missing. Palpi; first segment quadrate, the second with a length over twice its diameter, the third as long as the second, more slender, the fourth one-third longer than the third, fusiform. Abdomen fuscous yellowish; claws apparently simple or very minutely dentate, the pulvilli longer than the claws; ovipositor stout, as long as the body, the seventh abdominal segment somewhat swollen and thus suggestive of *Cystiphora*, the apex of the ovipositor strongly chitinized, blade-like and tapering to an acute apex. Type Cecid. a2573.

EXPLANATION OF PLATES

PLATE 1

215

Midge galls

- 1 Small gall of *Rhopalomyia capitata* Felt, on goldenrod
- 2 Galls of *Rhopalomyia racemicola* O. S. among goldenrod blossoms
- 3 Gall of *Rhopalomyia anthophila* O. S. among goldenrod blossoms
- 4 Old gall of the nun midge, *Asphondylia monacha* O. S., on narrow-leaved goldenrod
- 5 Fusiform gall, *Rhopalomyia fusiformis* Felt, on leaves and stems of narrow-leaved goldenrod
- 6 Stemmed fusiform gall, *Rhopalomyia pedicellata* Felt, among flowers and on leaves of narrow-leaved goldenrod
- 7 Irregular mine in goldenrod leaf, adult not reared
- 8 Blister gall of *Asteromyia flavolunata* Felt on goldenrod
- 9 Blister gall of *Asteromyia rubra* Felt on goldenrod
- 9a Lower surface of leaf showing the whitish discoloration produced by the gall
- 10 Small blister galls of *Asteromyia flavolunata* Felt on solidago
- 11 Blister gall on *Asteromyia rosea* Felt on *Solidago rugosa*
- 12 Blister gall of *Asteromyia laeviana* Felt on *Aster laevis*
- 12a Lower portion of leaf showing characteristic discoloration on under surface of the gall
- 13 Old blister gall of *Asteromyia rubra* Felt on solidago
- 14 Blister gall of *Asteromyia paniculata* Felt on *Aster paniculatus*
- 15 Dark blister leaf gall of *Asteromyia rubra* Felt on solidago
- 15a Under surface of infested leaf
- 16 Blister leaf gall of *Asteromyia carbonifera* Felt on narrow-leaved solidago
- 17 Blister gall of *Asteromyia* on solidago, adult unknown



L.H. JOUTEL.

MIDGE GALLS

- 18 Irregular blister gall of *Asteromyia* on *Aster laevis*, adult
unknown
- 19 Blister leaf gall of *Asteromyia laeviana* Felt on
Aster laevis
- 20 Blister leaf gall provisionally identified as that of *Aster-*
omyia rubra Felt, a rather lighter type
- 21 Gall of *Rhopalomyia clarkeae* Felt on *Solidago*
rugosa, natural size
- 21a Same gall, enlarged

PLATE 2
Midge galls

- 1 Stem of snapdragon, *Impatiens fulva*, infested with *Oecidium impatientis*, the latter inhabited by the larvae of *Mycodiplosis impatientis* Felt
- 2 The same fungus on leaves
- 3 Hazel leaf showing a pilose deformity from which was reared *Lasiopteryx coryli* Felt
- 4 Tumid midrib gall on ash from which have been reared *Contarinia canadensis* Felt, *Dasyneura tumidosae* Felt and which has been erroneously identified as the gall of *Cecidomyia pellex* O. S.
- 5 Blister leaf gall of *Asteromyia asterifoliae* Beutm. on aster leaves
- 6 Tumid vein swellings on soft maple from which has been reared *Dasyneura communis* Felt
- 7 Petiole gall on *Vitis bicolor*, producing *Schizomyia petiolicola* Felt
- 8 Upper surface of Linden leaf showing discoloration produced by the reddish galls of *Cecidomyia verrucicola* O. S., adult unknown
- 8a Under surface showing the size and globular character of the galls in a highly colored condition. Compare with plate 4, figures 5 and 6
- 9 Reddish swellings on under surface of hornbeam (*Carpinus*) leaves produced by *Cecidomyia pudibunda* O. S., adult unknown
- 10 Green bud gall on *Cornus stolonifera*, adult unknown
- 11 Discolored leaf mine inhabited by *Lasioptera excavata* Felt
- 11a Under surface of infested leaves
- 12 Swollen fruit of wild cherry, *Prunus virginiana*, from which has been reared *Contarinia virginianiae* Felt, *Parallelodiplosis acerneae* Felt, *Itonida canadensis* Felt, *Arthrocnodax apiphila* Felt, *Rhizomyia absobrina* Felt and a species of *Lestodiplosis*, the last is predaceous and the two preceding at least, probably inquilines
- 13 Leaves of Virginia creeper or woodbine with the midrib deformities produced by *Dasyneura parthenocissi* Stebb.
- 14 Petiole gall on fox grape, *Vitis labrusca*, produced by *Schizomyia petiolicola* Felt



L.H. JOUTEL.

MIDGE GALLS

- 15 Gall of *Cecidomyia* species on nettle, *Urtica gracilis*,
adult unknown
- 16 Gall of *Cecidomyia urnicola* O. S. on *Urtica*
gracilis, adult unknown
- 17 Peculiar adherent type of gall, potentially a bud deformation,
on solidago from which has been reared both the nun midge,
Asphondylia monacha O. S. and *Camptoneuromyia adhesa* Felt
- 18 Gall on leaf stem of *Vitis labrusca* produced by *Schiz-*
omyia petiolicola Felt
- 19 Swelling at base of leaf stalk of wild cherry produced by
Cecidomyia species, adult unknown
- 20 Another type of the same deformity

Midge galls

- 1 Vein gall on the under side of *Crataegus* leaves, *Lobopteromyia venae* Felt and *Dicrodiplosis venitalis* Felt were reared, the latter probably an inquiline.
- 1a Side view of the same
- 2 Vein gall on chestnut leaves, adult not reared
- 3 Seed pods of *Diervilla trifida* deformed by *Asphondylia diervillae* Felt
- 4 Leaf roll on poplar, producer unknown, from which has been reared the predaceous *Lestodiplosis populifolia* Felt
- 5 Larger leaf roll on poplar, adult unknown
- 6 Reddish, globular leaf gall with slit on under surface on poplar, from which the presumably inquiline, *Rhizomyia absobrina* Felt has been reared, true maker unknown
- 6a Upper portion of infested leaf
- 7 Enlargement of the petiole of poplar leaf possibly produced by the insect which makes the gall figured under A
- 8 Cockscomb gall on *Crataegus* leaves produced by *Hormomyia crataegifolia* Felt
- 9 Larger, globular leaf gall on poplar, adult not reared
- 9a Under side of same
- 10 Typical bud gall on *Diervilla trifida* produced by *Asphondylia diervillae*
- 11 Globose basal enlargement of poplar leaf, possibly an early stage of the reddish, tumid, irregular gall resembling that of *Lasioptera vitis* on grape, producer unknown
- 12 Inconspicuous vesicular swellings with a small slit on the under surface of poplar leaves, adult unknown
- 13 Tumid apical gall on black cherry, *Cecidomyia serotinae* O. S., adult not reared
- 13a Old gall produced by the above named species
- 14 Vein swelling on *Crataegus* leaves possibly identical with that figured under 1
- 15 Folded edge leaf gall on poplar as seen from above, adult not reared
- 15a Appearance of the same gall from below
- 16 Cylindric, fimbriate gall on *Crataegus* from which has been reared *Winnertzia hudsonici* Felt and *Rhizomyia absobrina* Felt, the latter at least probably an inquiline



MIDGE GALLS

- 17 A distinctly smaller, fimbriate, cylindric gall on *Crataegus*, possibly identical with the preceding, adult not reared
- 18 Globose galls on poplar leaves from which has been reared *Mycodiplosis populifolia* Felt, this latter possibly an inquiline
- 19 Ocellate galls on *Cornus stolonifera* from which has been reared *Lasioptera corni* Felt

PLATE 4

Midge galls

- 1 Variable twig swellings on wild cherry produced by midge larvae working in the subcortical layers, adult not reared
- 1a Section of such a deformity
- 2 An older type of gall than that represented in 1
- 2a An old scar in process of healing
- 3 Leaf gall of *Lasioptera farinosa* Beutm. on blackberry
- 3a Early stage of same gall showing reddish discoloration
- 4 Irregular twig galls of *Cecidomyia citrina* O. S., adult not reared
- 5 Early stage of leaf stem gall on Linden, probably produced by *Cecidomyia verrucicola* O. S., adult unknown. Compare with figures 8 and 8a on plate 2
- 6 Globular green gall on Linden leaf. See under 5
- 7 Bud gall on *Spiraea salicifolia* produced by *Hormomyia clarkeae* Felt
- 8 Tubular gall on the under surface of the leaf of *Cornus paniculata* produced by *Cecidomyia tuba* Stebb., adult unknown
- 9 Galls along the under side of the midrib of the bitternut hickory produced by *Caryomyia caryaecola* O. S.
- 10 Enlarged bud gall on *Rudbeckia* produced by *Asphondylia conspicua* O. S.
- 11 Apical bud gall on *solidago* produced by *Rhopalomyia hirtipes* O. S.
- 12 Midrib swelling on *Spiraea tomentosa* produced by *Rhabdophaga salicifolia* Felt
- 13 Side view of a gall on willow leaf produced by *Hormomyia verruca* Walsh
- 14 Cluster of older galls on willow leaf produced by *Hormomyia verruca* Walsh
- 15 Flower bud galls on *Eupatorium purpureum* produced by *Dasyneura purpurea* Felt
- 16 Fringed terminal bud gall on *Spiraea salicifolia*, adult unknown
- 17 Leaf of shadbush, *Amelanchier canadensis* deformed by *Hormomyia canadensis* Felt



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MIDGE GALLS

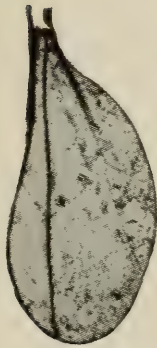
- 17a Same gall enlarged, showing the appearance of the upper surface of the leaf and a side view of several galls
- 18 Stem gall on thoroughwort produced by *Neolasioptera perfoliata* Felt
- 19 Blossom bud gall on white snake root, *Eupatorium urticaefolium*, from which has been reared *Lestodiplosis eupatorii* Felt, true producer unknown

PLATE 5

Gall midge wings

- 1 Wing of *Rhabdophaga populi* Felt, C. 78, x 20
- 2 Wing of *Rhabdophaga acerifolia* Felt, C. 36, x 20
- 3 Wing of *Rhabdophaga consobrina* Felt, C. 39, x 20
- 4 Wing of *Rhabdophaga batatas* Walsh, C. a686, x 20
- 5 Wing of *R. batatas* Walsh, female, x 20

Plate 5



1

2

4



3



5

Gall midge wings

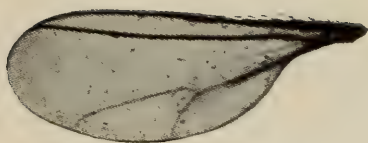
PLATE 6

225

Gall midge wings

- 1 Wing of *Dasyneura trifolii* Loew, C. 742, x 20
- 2 Wing of *Dasyneura photophila* Felt, C. 193, x 20
- 3 Wing of *Dasyneura unguicula* Felt, C. 745, x 20
- 4 Wing of *Dasyneura bidentata* Felt, C. 344, x 20
- 5 Wing of *Lasiopteryx flavotibialis* Felt, C. a1454,
x 20
- 6 Wing of *Diarthronomyia artemisiae* Felt, C. 989,
x 15

Plate 6



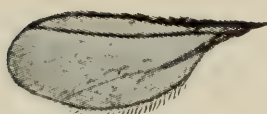
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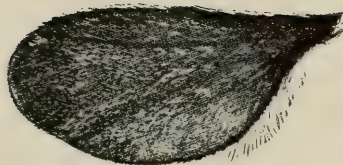
2



3



4



5



6

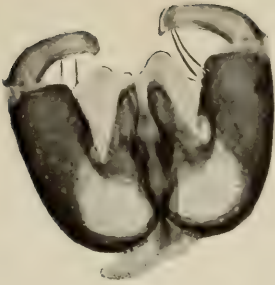
Gall midge wings

PLATE 7

227

Gall midge genitalia

- 1 Genitalia of *Dasyneura quercina* Felt, C. 47, x 260
- 2 Genitalia of *Rhabdophaga populi* Felt, C. 78X, x 260
- 3 Genitalia of *Rhabdophaga batatas* Walsh, C. 1102,
x 260
- 4 Genitalia of *Rhabdophaga consobrina* Felt, C. 39.
x 260



1



2



3



4

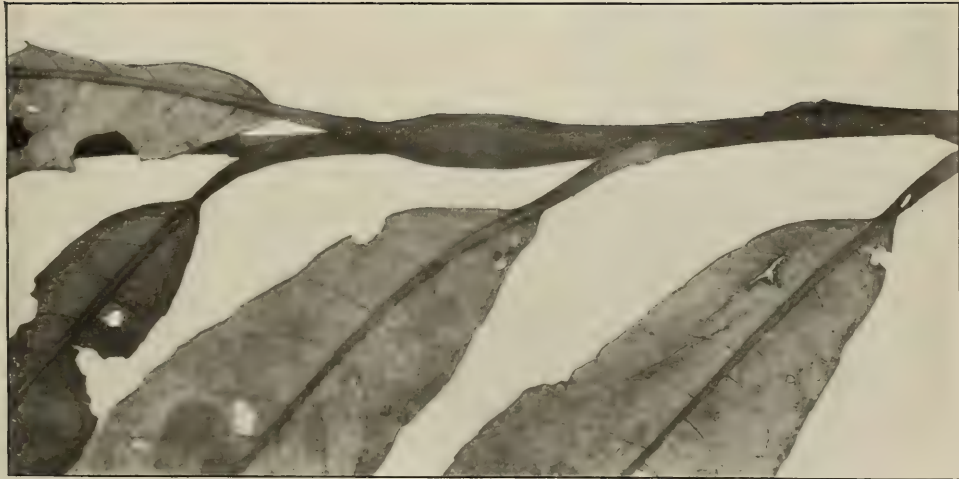
Gall midge genitalia

PLATE 8

229

Midge galls

- 1 A twig swelling on *Salix* provisionally referred to *Rhabdophaga nodula* Walsh
- 2 Twig swelling on *Salix* provisionally referred to the genus *Rhabdophaga*, adult unknown
- 3 Gall of *Cystiphora viburnifolia* Felt on *Viburnum dentatum*. Photo by Miss Cora H. Clarke
- 4 Gall of *Dasyneura gleditschiae* Felt on honey locust. Photo by Miss Cora H. Clarke



1



2



3



4

PLATE 9

231

Midge galls

Leaf galls of *Dasyneura salicifolia* Felt on *Salix*:



Galls of *Dasyneura salicifolia*

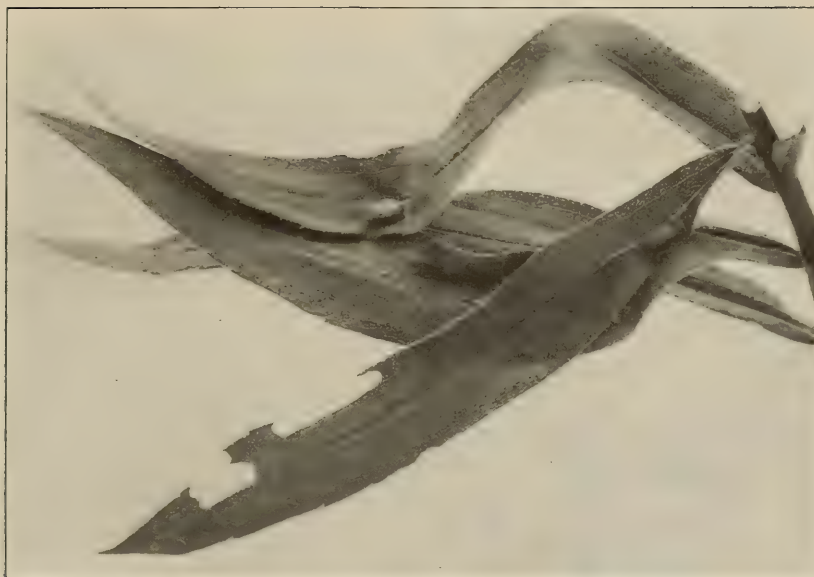
PLATE 10

233

Midge galls

- 1 Bud galls produced by *Dasyneura lysimachiae* Beutm.
on loose strife
- 2 Adherent type of gall on solidago from which has been reared
Camptoneuromyia adhesa Felt and *Asphondylia monacha* O. S.

Plate 10



2



1

Midge galls

PLATE 11

235

Midge galls

Galls of *Rhabdophaga rosacea* Felt on wild rose

Plate II



Galls of *Rhabdophaga rosacea*

PLATE 12

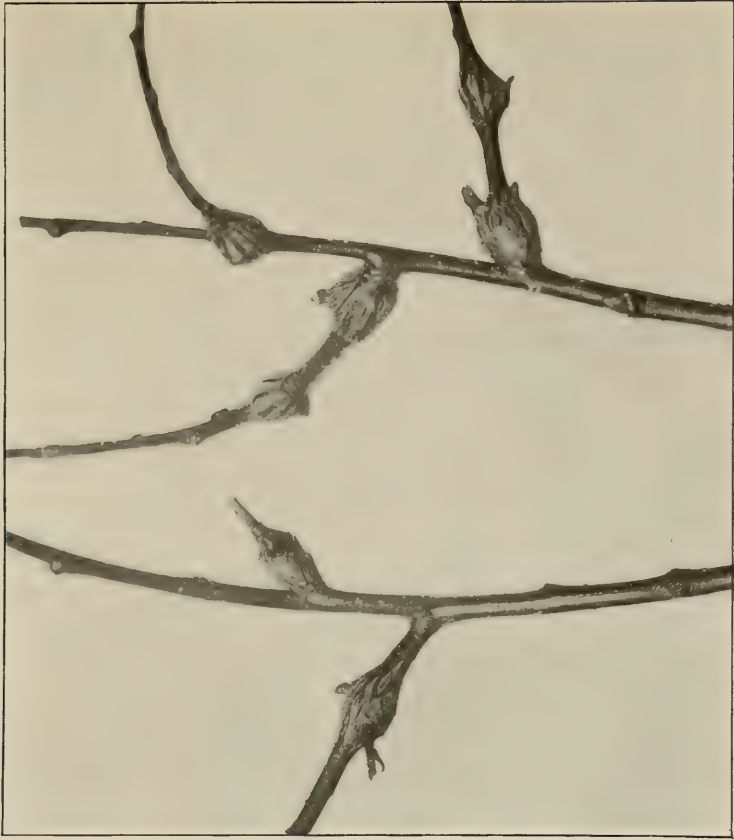
237

Midge galls

- 1 Typical deformities on willow twigs produced by *Rhabdophaga nodula* Walsh, though the coalescing of several is somewhat uncommon
- 2 Apparently the same gall as the above, except that the bark covering the deformity is cracked in an unusual manner



1



2

Galls of *Rhabdophaga nodula*

PLATE 13

239

Midge galls

- 1 A rather stout type of gall on *Salix* produced by *Rhabdophaga triticoides* Walsh
- 2 The more usual type of *R. triticoides* Walsh gall with a few leaves attached to the stem

Plate 13



Midge galls

PLATE 14

241

Midge galls

- 1 Typical deformity on Salix twigs produced by *Rhabdophaga triticoides* Walsh
- 2 Early, leafy stage of the *R. triticoides* gall



I



2

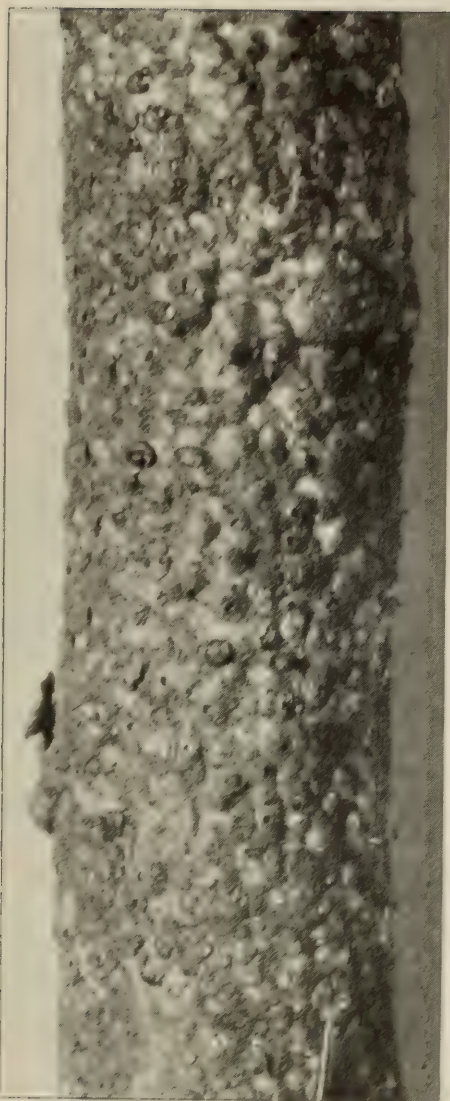
Midge galls

PLATE 15

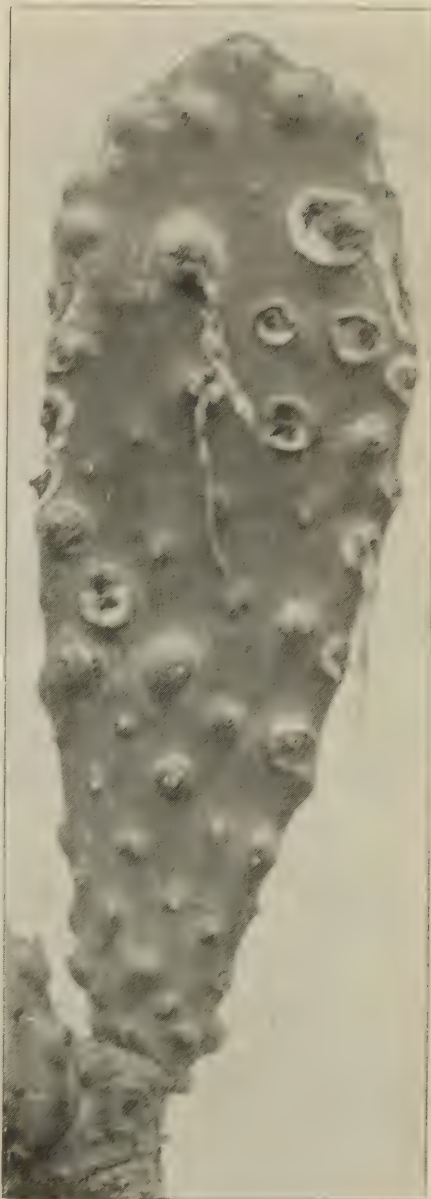
243

- 1 Twig badly infested by San José scale and showing the numerous irregularly circular exit holes of parasites, x 4
- 2 Lobe of Cactus showing exudations from wounds caused by the larvae of the Cactus midge, *Itonida opuntiae* Felt

Plate 15



1



2

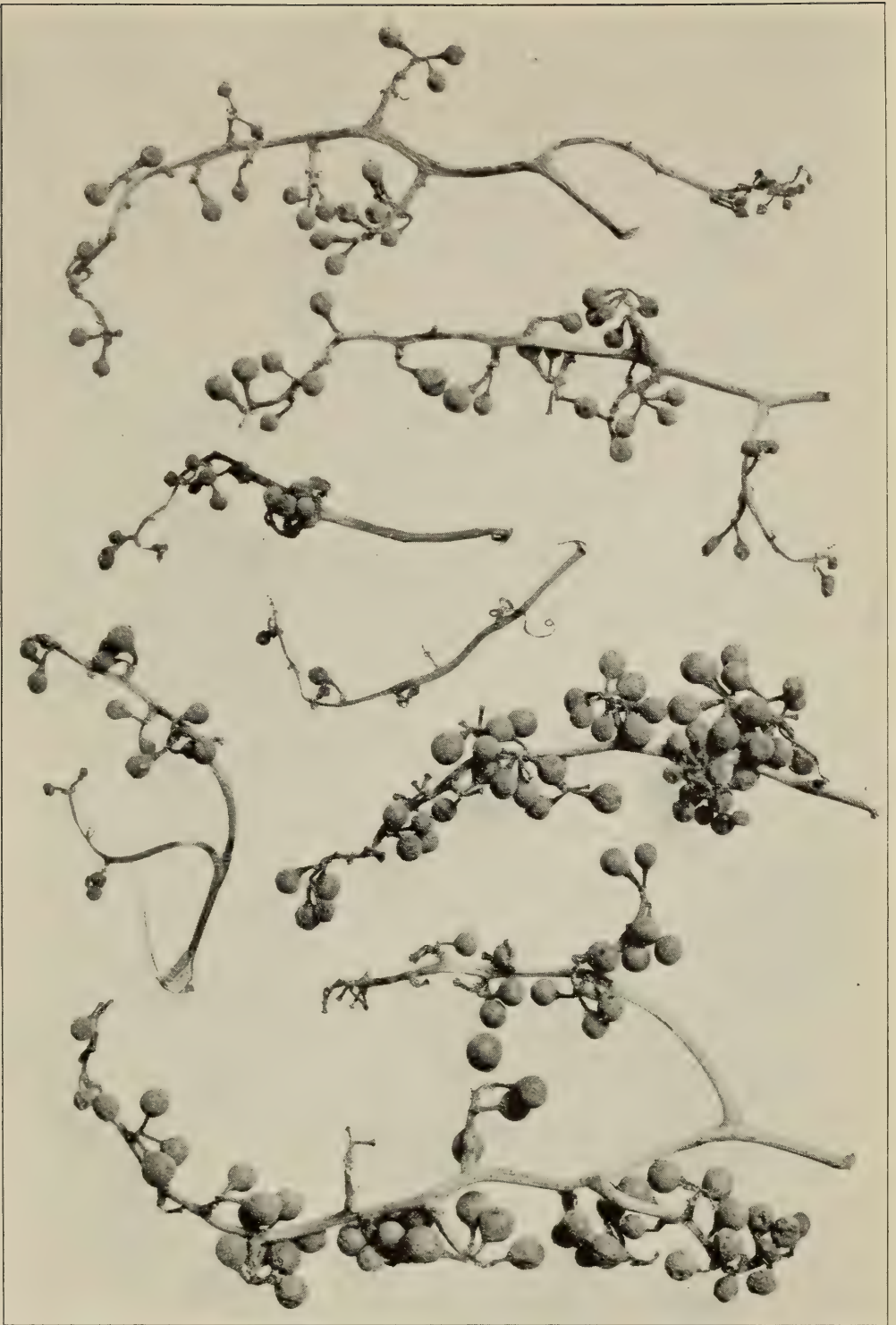
San José scale parasites and Cactus midge work

PLATE 16

245

I Clusters of grapes injured by the banded grape bug, *Paracalocoris scrupus* Say

Plate 16



Grapes injured by plant bug

INDEX

- abdominalis**, Aulacus, 29
- aberrata, Dasyneura, 123, 157
- Abies *sp.*, 136
- abietinus, Mindarus, 48, 64
- abietis, Chermes, 48, 59
- absobrina, Rhabdophaga, 87, 108
 - Rhizomyia, 203, 206
- Acarina, additions to collection, 78
- Acer rubrum, 181
 - saccharinum, 93
- acericola, Phenacoccus, 8, 59
 - Pulvinaria, 48
- acerifolia, Dasyneura, 124, 125, 159
 - Rhabdophaga, 85, 99
- aceris, Rhabdophaga, 83, 85, 93
 - Winnertzia, 71
- Acorn, galls on, 137
- Adalia bipunctata, 53, 68
- Additions to collections, 72-78
- adhesa, Camptoneuromyia, 206
- affinis, Leucospis, 66
- Agilus bilineatus, 9
- Agrostis saucia, 56
 - vulgaris, 135
- albennnis, Bibio, 66
- albohirta, Dasyneura, 124, 159
- albovittata, Dasyneura, 126, 127, 128, 179
- Alders, galls on, 187
- alnicola, Polygnotus, 187
 - Polymecus, 187
- Alnus crispa, 187
- Ambrosia beetle, pitted, 9, 36
- americana, Dasyneura, 126, 168
 - Malacosoma, 49, 69
- ampelophila, Dasyneura, 119, 140
- Anagrus spiritus, 187
- ananassi, Thecodiplosis, 68
- Anatis ocellata, 64
- anemone, Dasyneura, 118, 121, 139
- Anemone canadense, 139
- Anopodias error, 176
- antennata, Dasyneura, 124, 160
 - Dicrodiplosis, 68
- anthici, Itonida, 69
- Aphelinus fuscipennis, 55
- aphidivora, Itonida, 68
- Aphids, 70
- apicata, Dasyneura, 121, 152
- Apple tent caterpillar, 5, 10, 49-50, 69, 70
- Apple tree, injurious insects:
 - codling moth, 13
 - red bug, 6
 - false, 51
 - San José scale, 54
- aprilis, Itonida, 68
- Arbor vitae leaf miner, 22
- Argyresthia thuiella, 22
- arizonensis, Lasiopteryx, 190, 195
- Arnoldia, 80, 196
 - gemmarum, 196
- aromaticae, Dasyneura, 129, 183
- Arsenate of lead, 50
- Artemisia californica, 209, 211
 - tridentata, 209
- artemisiae, Diarthronomyia, 208, 209
- Ash, galls on, 133, 146, 152, 203
- Asphondylia conspicua, 71
 - monacha, 206
- Asphondyliariae, 79
- Aspidiotus osborni, 48
 - perniciosus, 53
- Aster, galls on, 134, 158
- Asteromyia carbonifera, 132
- Astrodiplosis, 71
 - speciosa, 71
- attenuata, Dasyneura, 129, 184
- augusta, Dasyneura, 125, 165
- Aulacus abdominalis, 29
- aurihirta, Dasyneura, 118, 137
- Azalea, rhododendron clear-wing in-
juring, 21
- Azalea leaf skeletonizer, 21
- azaleae, Gracilaria, 21
- Baccha** fascipennis, 59
- Balsam plant louse, 48

- banburyana, *Opuntia*, 39
 Banded grape bug, 6, 41
 Barcurol solution, 33
 Bark beetles, 9
 batatas, *Rhabdophaga*, 86, 87, 92, 105
Batrachedra rileyi, 16
 Beach-pea, galls on, 149
 Bedstraw, bud galls on, 168
 Beech, galls on, 196, 211
Bertiera, 81
 Bibio, white winged, 66
Bibio albipennis, 66
 marci, 66
bidentata, *Dasyneura*, 117, 133
bilineatus, *Agrilus*, 9
bilobatus, *Odontaulacus*, 29
binotata, *Hyperaspis signata* var., 53
bipunctata, *Adalia*, 53, 68
 Birch tree, *Bolitophila cinerea* injuring, 67
 Blackberry, galls on, 138
 Blueberry, bud gall on, 145
Bolitophila cinerea, 67
borealis, *Dasyneura*, 118, 136
Bracon pectorator, 29
brassicoides, *Rhabdophaga*, 87, 88, 103, 110, 113
 Brown-tail moth, 7
bucculatricis, *Pentocnemus*, 23
 Button ball, galls on, 104
Cactus midge, 9, 39
californica, *Artemisia*, 211
 Dasyneura, 125, 164
 Diarthronomyia, 209
 Dicrodiplosis, 68
 Rhabdophaga, 85, 98
Calopedila, 81
Calosoma calidum, 68
Camptomyia tsugae, 29, 71
Camptoneuromyia adhesa, 206
 Canada thistle, galls on, 158, 170
canadensis, *Cystiphora*, 201
 Dasyneura, 124, 129, 162
carbonaria, *Dasyneura*, 117, 132
carbonifera, *Asteromyia*, 132
Carex vulpinoidea, 153
caricis, *Dasyneura*, 121, 122, 153
carinatus, *Tetrastichus*, 176
carpini, *Lasipteryx*, 196
Carpinus americana, 196
Carpocapsa pomonella, 13
Carya, 156
Caryomyia persicoides, 108
 Cassava, galls on, 195
caulicola, *Rhabdophaga*, 86, 87, 103
Ceanothus americanus, 132, 137
Cecidomyia, 115
 ocellaris, 68
 oxycoccana, 151
 pini, 115
 quercus, 196
 vaccinii, 151
 viminalis, 82
cephalanthi, *Rhabdophaga*, 86, 104
Cephalanthus occidentalis, 104
cerasi, *Rhizomyia*, 203, 205
Ceratopogon, 69
cercocarpi, *Dasyneura*, 71, 128, 129, 183
Cercocarpus parvifolius, 183
Chermes abietis, 48, 59
 floccus, 48
 Cherry tree, galls on, 156, 205
 Cherry tree, wild, injurious insects:
 apple tent caterpillar, 5, 49-50
 forest tent caterpillar, 61
 Chestnut borer, two-lined, 9
Chiloneurus sp., 55
 Choke cherry, galls on, 95
cincta, *Rhizomyia*, 202, 204
Cincticornia, 79
cinerea, *Bolitophila*, 67
circinans, *Dryomyia*, 196
cirsioni, *Dasyneura*, 123, 158
Cirsium arvense, 158, 170
clematidis, *Dasyneura*, 120, 121, 147
Clematis virginiana, 147
cleri, *Eupelmus*, 29
Clinodiplosis examinis, 71
Clinorhyncha, 79
 Clover, red, galls on, 99, 143, 181
 sweet, galls on, 185
 white, galls on, 143
 Clover seed midge, 172
cocci, *Karschomyia*, 71
Coccidomyia, 80, 81, 210
 erii, 211
 pennsylvanica, 210
Coccolobis floridana, 208

Coccophagus immaculatus, 55
 Cockscomb gall, 58
 Codling moth, 6, 13, 69, 70
 Coleoptera, additions to collection, 72
 Collections, 10; additions to, 72-78
Colopha ulmicola, 58
coloradensis, *Contarinia*, 68
 Procystiphora, 212
columbianus, *Corthylus*, 37
communis, *Dasyneura*, 127, 128, 181
Conotrachelus nenuphar, 50
consobrina, *Dasyneura*, 129, 185
 Rhabdophaga, 86, 107
conspicua, *Asphondylia*, 71
Contarinia coloradensis, 68
 Corn borer, lined, 7, 14
Cornus, galls on, 204, 205
 forest tent caterpillar injuring, 61
cornuta, *Rhabdophaga*, 87, 110
 Corrodentia, additions to collection, 75
Corthylus columbianus, 37
 punctatissimus, 9, 36
corticis, *Dasyneura*, 126, 128, 168
coryli, *Lasiopteryx*, 190, 193
coryloides, *Rhabdophaga*, 111
 Cotton, gall midge beneficial to, 9
 Cranberry, galls on, 150
 Cranesbill, galls on, 148, 159
Crataegus, galls on, 206, 208
crispata, *Lasiopteryx*, 196
Ctenodactylomyia, 81, 208
 watsoni, 208
 Cutworms, 15
 variegated, 56
cyanococchi, *Dasyneura*, 120, 145
Cyllene robiniae, 62
Cystiphora, 81, 200
 canadensis, 201
 viburnifolia, 201
Cystodiplosis eugeniae, 69

***Dasyneura*, 80, 115**

aberrata, 123, 157
acerifolia, 124, 125, 159
albohirta, 124, 159
albovittata, 126, 127, 128, 179
americana, 126, 168
ampelophila, 119, 140
anemone, 118, 121, 139

***Dasyneura* (*continued*)**

antennata, 124, 160
apicata, 121, 152
aromaticae, 129, 183
attenuata, 129, 184
augusta, 125, 165
aurihirta, 118, 137
bidentata, 117, 133
borealis, 118, 136
californica, 125, 164
canadensis, 124, 129, 162
carbonaria, 117, 132
caricis, 121, 122, 153
cercocarpi, 71, 128, 129, 183
cirsioni, 123, 158
clematidis, 120, 121, 147
communis, 127, 128, 181
consobrina, 129, 185
corticis, 126, 128, 168
cyanococchi, 120, 145
denticulata, 125, 165
eugeniae, 123, 150
filicis, 120, 148
flavescens, 120, 146
flavicornis, 121, 148
flavoabdominalis, 128, 183
flavoscuta, 129, 184
florida, 123, 157
fraxinifolia, 117, 118, 119, 133
fulva, 126, 171
gemmae, 127, 130, 177
gibsoni, 126, 170
glandis, 118, 137
gleditschiae, 124, 163
graminis, 118, 135, 184
kärnerensis, 117, 134
leguminicola, 127, 128, 172
lepidii, 122, 154
luteofusca, 115
lysimachiae, 128, 129, 182
maculosa, 117, 131
maritima, 121, 122, 123, 149
meliloti, 129, 185
modesta, 121, 152
multiannulata, 123, 156
parthenocissi, 71, 122, 123, 161
pedalis, 130, 186
pergandei, 123, 156
photophila, 119, 139
piperitae, 118, 136

Dasyneura (*continued*)

- pseudacaciae*, 125, 163
- pudorosa*, 119, 142
- purpurea*, 127, 181
- quercina*, 122, 154
- radifolii*, 127, 130, 178
- rhodophaga*, 9, 117, 130
- rhois*, 120, 146
- rosarum*, 125, 166
- rubiflorae*, 118, 119, 138
- rufipedalis*, 128, 181
- salicifolia*, 126, 128, 169
- scutata*, 124, 158
- semenivora*, 126, 127, 166
- serrulatae*, 130, 186
- setosa*, 119, 141
- similis*, 124, 160
- simulator*, 120, 142
- sisymbrii*, 116
- smilacifolia*, 121, 122, 147
- smilacinae*, 122, 123, 155
- spiraeina*, 117, 135
- toweri*, 130, 187
- trifolii*, 120, 121, 122, 143
- tumidosae*, 123, 155
- ulmea*, 127, 171
- unguicula*, 119, 141
- urticae*, 116
- vaccinii*, 121, 122, 150
- vernalis*, 117, 132
- virginiana*, 207
- vitis*, 117, 134
- yuccae*, 119, 140
- Dasyneurariariae*, 79, 80
- Decatoma* *sp.*, 176
- denticulata*, *Dasyneura*, 125, 165
- Diarthronomyia*, 81, 208
 - artemisiae*, 208, 209
 - californica*, 209
- Dichelomyia*, 81, 115
- Dicrodiplosis antennata*, 68
 - californica*, 68
 - helena*, 68
- Didactylomyia*, 79
- Diptera*, additions to collection, 73
- disstria*, *Malacosoma*, 61
- Dogwood*, pitted *Ambrosia* beetle injuring, 38
- dorsata*, *Porricondyla*, 68
- Drosophila repleta*, 71
- Drug store beetle*, 64

Dryocosmus favus, 48*Dryomyia*, 81, 198*circinans*, 196*folliculi*, 199*dryorhizoxeni*, *Eupelmus*, 89, 182*dulichii*, *Thecodiplosis*, 68***Eccoptogaster*** *quadrispinosa*, 8, 33*Elm*, galls on, 99, 107, 108, 171

injurious insects:

elm leaf beetle, 7, 56

forest tent caterpillar, 61

protection, 71

elymi, *Rhabdophaga*, 83, 90*Elymus americanus*, 90*Enarmonia interstinctana*, 177

English elm pouch gall, 57

Epidosariae, 79*erii*, *Coccidomyia*, 211*Erium lichtensioides*, 211error, *Anopedias*, 176*Eugenia buxifolia*, 150*eugeniae*, *Cystodiplosis*, 69*Dasyneura*, 123, 150*Eupatorium purpureum*, 181*Eupelmus cleri*, 29*dryorhizoxeni*, 89, 182

European grain moth, 16

European wolfmoth, 7

Eurytoma studiosa, 110*Euthrips pyri*, 6, 50

Evergreens, gipsy moth injuring, 7

examinis, *Clinodiplosis*, 71***Fagus*** *grandifolia*, 211

False maple scale, 8, 59

False red bug, 51

False Solomon seal, galls on, 155

fascipennis, *Baccha*, 59

Faunal studies, 10

favus, *Dryocosmus*, 48*felti*, *Osmia*, 65

Fern, galls on, 148, 159

Fiery ground beetle, 68

Fig, galls on, 193

filicis, *Dasyneura*, 120, 148*fitchii*, *Promachus*, 7, 26*flavescens*, *Dasyneura*, 120, 146*flavicornis*, *Dasyneura*, 121, 148*flavoabdominalis*, *Dasyneura*, 128, 183

- flavoscuta, *Dasyneura*, 129, 184
- flavotibialis, *Lasipteryx*, 190
- Flies, 9, 68, 70
- flocus, *Chermes*, 48
- florida, *Dasyneura*, 123, 157
- folliculi, *Dryomyia*, 199
- Forest tent caterpillar, 5, 10, 61, 70
- Forest tree pests, 8, 61-64
- fractilinea, *Hadena*, 7, 14
- fraxinifolia, *Dasyneura*, 117, 118, 119, 133
- Rhizomyia*, 202, 203
- Fraxinus, 146, 152, 203
- Fruit tree pests, 49
- fulva, *Dasyneura*, 126, 171
- fulvoguttata, *Melanophila*, 8, 26
- fumiferana, *Tortrix*, 49
- Fungicides, formulas for, 70
- fusca, *Lachnosterna*, 24
- fuscipennis, *Aphelinus*, 55
- Galerucella luteola***, 56
- Galium asprellum*, 168
- Gall midges, 9, 10, 68, 69, 71, 79-211
- gemmae, *Dasyneura*, 127, 130, 177
- Rhabdophaga*, 86, 100
- gemmarum, *Arnoldia*, 196
- Geocrypta*, 81
- georgina, *Sarcophaga*, 71
- Geranium maculatum*, 159
- gibsoni, *Dasyneura*, 126, 170
- Gipsy moth, 7
- glandis, *Dasyneura*, 118, 137
- Gleditschia triacanthos*, 163
- gleditschiae, *Dasyneura*, 124, 163
- globosa, *Rhabdophaga*, 85, 100
- Gnophomyia tristissima*, 49
- Goldenrod, *see* *Solidago*
- Gouty pine midge, 70
- Gracilaria azaleae*, 21
- gracilis, *Rhodites*, 48
- grain moth, 7, 16
- pests, 7
- graminis, *Dasyneura*, 118, 135, 184
- granella, *Tinea*, 7, 16
- Grape, galls on, 134, 195, 206
- Grape bug, banded, 6, 41
- Grass pests, 7
- Grass webworms, 15
- Ground beetle, fiery, 68
- Guarephila, 81
- Hadena fractilinea*, 7, 14
- misera, 14
- stipata, 14
- Hazel, pitted *Ambrosia* beetle injuring, 38
- Hazel leaves, galls on, 193
- helena, *Dicrodiplosis*, 68
- Hemiptera, additions to collection, 75
- Hemlock borer, spotted, 8, 26
- Heterocordylus malinus*, 6
- Heteropezinae*, 79
- Hickory bark borer, 8, 33
- Hickory leaf gall midges, 71
- Hickory trees, 69
- galls on, 156
- hirta, *Rhizomyia*, 203, 208
- hirticornis, *Rhabdophaga*, 87, 108
- hispida, *Rhizomyia*, 203, 205
- Hobblebush, galls on, 201
- House fly, 9, 10
- Household entomology, 68
- Howard, L. O., acknowledgments to, 12
- Huckleberry, galls on, 171
- pitted *Ambrosia* beetle injuring, 38
- Hydrocyanic acid gas, 41
- Hymenoptera, additions to collection, 72
- Hyperaspis signata var. binotata*, 53, 59
- Hypericum mutilum*, 187
- immaculatus, *Coccophagus*, 55
- inopis, *Itonida*, 70
- inornata, *Tiphia*, 24
- Insecticides, 5; formulas for, 70
- insidiosus, *Triphleps*, 176
- insularis, *Mycodiplosis*, 71
- Xylonomus*, 29
- interstinctana, *Enarmonia*, 177
- Ironwood, galls on, 196
- pitted *Ambrosia* beetle injuring, 38
- Itonida anthici*, 69
- aphidivora, 68
- aprilis, 68
- inopis, 70
- opuntiae, 9, 39
- putrida, 68
- resinicola, 68
- Itonididae, 9, 10, 68

Itonididinae, 79-211

Itonididinariae, 79

Joe-Pye weed, galls on, 181

June beetles, 24

June grass, galls on, 135

juvenalis, *Porricondyla*, 68

karnerensis, *Dasyneura*, 117, 134

Karschomyia cocci, 71

Lachnosterna fusca, 24

tristis, 25

Ladybeetle, 59

two-spotted, 53, 68

15 spotted, 64

Lasioptera vitis, 134, 206

Lasiopterariae, 79

Lasiopteryx, 80, 189

arizonensis, 190, 195

carpini, 196

coryli, 190, 193

crispata, 196

flavotibialis, 190

manihot, 190, 195

schwarzi, 190, 193

latebrosa, *Rhabdophaga*, 84, 97

Lathyrus maritimus, 149

Leaf miner, *Arbor vitae*, 22

Lecanium, galls on, 210

Lectures, 10

ledi, *Pseudococcus*, 48

Ledomyia, 189

leguminicola, *Dasyneura*, 127, 128, 172

lepidii, *Dasyneura*, 122, 154

Lepidium virginicum, 154

Lepidomyia, 189

Lepidoptera, additions to collections, 74

Lestremiinae, 79

Lettuce, white, leaf galls on, 201

Leucospis affinis, 66

lichtensioides, *Erium*, 211

Lime-sulphur wash, 6, 50, 53, 54

Lined corn borer, 7, 14

liriodendri, *Toumeyella*, 8, 60

Locust, black, galls on, 164

locust borer injuring, 62

Locust, honey, galls on, 163

Loosestrife, whorled, leaf galls on, 182

luteofusca, *Dasyneura*, 115

luteola, *Galerucella*, 56

Lygidea mendax, 6, 51

Lygus pratensis, 51

Lysimachia quadrifolia, 182

terrestris, 182

lysimachiae, *Dasyneura*, 128, 129, 182

Macrolabis, 81, 196

maculosa, *Dasyneura*, 117, 131

Malacosoma americana, 49, 69

disstria, 61

malinus, *Heterocordylus*, 6

manihot, *Lasipteryx*, 190, 195

Manihot utilissima, 195

Maple, galls on, 93, 99, 107, 108, 159

injurious insects:

false maple scale, 59

forest tent caterpillar, 61

Maple, soft, galls on, 94, 181

Maple, sugar, galls on, 160

injurious insects:

forest tent caterpillar, 5, 61

pitted ambrosia beetle, 37

use of miscible oils on, 45-47

Maple scale, false, 8, 59

marci, *Bibio*, 66

marginata, *Rhabdophaga*, 84

marilandica, *Neocatocha*, 68

maritima, *Dasyneura*, 121, 122, 123, 149

Mason bee, 65

Meadowsweet, galls on, 106

Megachile, 65

melampodia, *Psilocephala*, 49

Melanophila fulvoguttata, 8, 26

meles, *Phytonomus*, 69

meliloti, *Dasyneura*, 129, 185

Melilotus alba, 185

mendax, *Lygidea*, 6, 51

Mentha piperita, 136

Microperisissia, 80

Mindarus abietinus, 48, 64

minor, *Neuromyia*, 197

Mint, galls on, 183

Miscible oils, use on trees, 45-47

misera, *Hadena*, 14

modesta, *Dasyneura*, 121, 152

- monacha, *Asphondylia*, 206
 Mosquitos, 9, 68, 70
 Mountain laurel, *rhododendron* clear-wing injuring, 21
 multiannulata, *Dasyneura*, 123, 156
Mycodiplosis insularis, 71

Naphthalin, 66
 nenuphar, *Conotrachelus*, 50
Neocatocha, 68
 marilandica, 68
Neocerata, 115
Neptunimyia, 68
 tridens, 68
Netiromyia, 80, 196, 197
 minor, 197
Neuroterus saltatorius, 68
 New Jersey tea, galls on, 132, 137
 nodula, *Rhabdophaga*, 83, 84, 91
 normaniana, *Rhabdophaga*, 86, 103
 Nursery inspection, 11

 Oak, galls on, 157, 165, 191
 injurious insects:
 chestnut borer, two lined, 9
 forest tent caterpillar, 5, 61
 Oak, red, galls on, 152, 154, 158
 Oak, white, galls on, 133
 Aspidiotus osborni injuring, 48
Oakesia sessilifolia, 196
obscuripennis, *Platygaster*, 89, 91
occidentalis, *Rhabdophaga*, 85, 98
ocellaris, *Cecidomyia*, 68
ocellata, *Anatis*, 64
Odontaulacus bilobatus, 29
 Oils, use of on trees, 45-47
Oligotrophiariae, 79
Opuntia banburyana, 39
opuntiae, *Itonida*, 9, 39
 Orchard insects, 68, 70
 osborni, *Aspidiotus*, 48
Osmia felti, 65
ostensackenii, *Torymus*, 106, 187
oxycoccana, *Cecidomyia*, 151
 Oyster scale, 70

Panicea, *Sitodrepa*, 64
Paracalocoris scrupeus, 6, 41
parthenocissi, *Dasyneura*, 71, 122, 123, 161

 Pear psylla, 6, 52
 Pear thrips, 6, 50-51
 Pear tree, injurious insects
 pear thrips, 50
 San José scale, 54
pectinator, *Bracon*, 29
pedalis, *Dasyneura*, 130, 186
Pemphigus ulmifusus, 58
pennsylvanica, *Coccidomyia*, 210
Pentocnemus bucculatricis, 23
 Peppermint, galls on, 136
pergandei, *Dasyneura*, 123, 156
Pernettyella, 80
perniciosi, *Prospaltella*, 54
perniciosus, *Aspidiotus*, 53
perplexa, *Rhizomyia*, 202
Perrisia, 115, 116
persimilis, *Rhabdophaga*, 90
 Petroleum, 5
Phenacoccus acericola, 8, 59
Phormia regina, 71
photophila, *Dasyneura*, 119, 139
Physokermes piceae, 59
Phytonomus meles, 69
Phytophaga rigidae, 88
 ulmi, 68
Picea canadensis, 162, 165
 piceae, *Physokermes*, 59
 Pine, white, galls on, 185
 white pine weevil injuring, 8
 Pine midge, gouty, 70
 Pine weevil, white, 30
pini, *Cecidomyia*, 115
Pinus strobus, 185
 piperitate, *Dasyneura*, 118, 136
Pissodes strobi, 8, 30
 Pitted Ambrosia beetle, 9, 36
 Plant lice, 53, 70
Platygaster obscuripennis, 89, 91
Platypus punctualtus, 71
 Plecoptera, additions to collection, 77
plicata, *Rhabdophaga*, 83, 93
 Plum curculio, 50
podagrae, *Rhabdophaga*, 87, 88, 109
podisi, *Telenomus*, 176
 Poison ivy, galls on, 146
Polygnotus sp., 176
 alnicola, 187
Polymecus alnicola, 187

- Polynema striaticornis*, 89, 176
pomonella, *Carpocapsa*, 13
Poplar, forest tent caterpillar injuring, 5, 61
 galls on, 102
populi, *Rhabdophaga*, 86, 102
Populus tremuloides, 102
porrecta, *Rhabdophaga*, 86, 101
Porricondyla dorsata, 68
 juvenalis, 68
pratensis, *Lygus*, 51
 Rhabdophaga, 85, 99
Prenanthes alba, 201
 altissima, 201
Procystiphora, 80, 212
 coloradensis, 212
Promachus fitchii, 7, 26
Prospaltella perniciosi, 54
Prunus melanocarpa, 156
 serotina, 205
 virginiana, 95
Psedera quinquefolia, 140
pseudacaciae, *Dasyneura*, 125, 163
Pseudococcus ledi, 48
Psilocephala melampodia, 49
Psylla pyricola, 52
Psyllaephagus sp., 55
Publications, 10, 68-72
pudorosa, *Dasyneura*, 119, 142
Pulvinaria acericola, 48
punctatissimus, *Corthylus*, 9, 36
punctulatus, *Platypus*, 71
purpurea, *Dasyneura*, 127, 181
putrida, *Itonida*, 68
pyri, *Euthrips*, 6, 50
pyricola, *Psylla*, 52

quadrispinosa, *Eccoptogaster*, 8, 33
quercina, *Dasyneura*, 122, 154
Quercus, 165
 sp., 137
 alba, 133
 rubra, 154
quercus, *Cecidomyia*, 196

racemi, *Rhabdophaga*, 84, 85, 94
radifolii, *Dasyneura*, 127, 130, 178
ramuscula, *Rhabdophaga*, 83, 84, 92
Rattlesnake root, leaf galls on, 201
Recurvaria thujaella, 23

Red bugs, 6, 70
 false, 51
regina, *Phormia*, 71
Remedies and preventives:
 arsenate of lead, 50
 barcurol solution, 33
 carbon bisulphid, 65
 hydrocyanic acid gas, 41, 65
 kerosene, 60
 lime, 66
 lime-sulphur washes, 6, 50, 53, 54
 naphthalin, 66
 petroleum, 5
 tobacco preparation, 44, 51, 52, 70
 whale oil soap solution, 53
Remedies and preventives for:
 aphids, 70
 apple tent caterpillar, 50
 arbor vitae leaf miner, 24
 Azalea leaf skeletonizer, 22
 banded grape bug, 44
 cactus midge, 41
 clover seed midge, 176
 codling moth, 6, 13, 70
 drug store beetle, 65
 elm leaf beetle, 56
 English elm pouch gall, 58
 European grain moth, 18
 false red bug, 52
 forest tent caterpillar, 62
 hickory bark borer, 33
 house fly, 70
 lined corn borer, 15
 locust borer, 63
 mosquitos, 70
 pear psylla, 6, 53
 pear thrips, 50
 pitted Ambrosia beetle, 38
 plant lice, 53
 rhododendron clear-wing, 21
 rose leaf hopper, 70
 San José scale, 6, 50, 54, 69
 spotted hemlock borer, 29
 tulip tree scale, 60
 white pine weevil, 8, 32
 white-winged Bibio, 66
repleta, *Drosophila*, 71
resinicola, *Itonida*, 68
Rhabdophaga, 80, 81
 absobrina, 87, 108
 acerifolia, 85, 99

Rhabdophaga (continued)

aceris, 68, 83, 85, 93
 batatas, 86, 87, 92, 105
 brassicoides, 87, 88, 103, 110, 113
 californica, 85, 98
 caulicola, 86, 87, 103
 cephalanthi, 86, 104
 consobrina, 86, 107
 cornuta, 87, 110
 coryloides, 111
 elymi, 83, 90
 gemmae, 86, 100
 globosa, 85, 100
 hirticornis, 87, 108
 latebrosa, 84, 97
 marginata, 84, 95
 nodula, 83, 84, 91
 normaniana, 86, 103
 occidentalis, 85, 98
 persimilis, 90
 plicata, 83, 93
 podagrae, 87, 88, 109
 populi, 86, 102
 porrecta, 86, 101
 pratensis, 85, 99
 racemi, 84, 85, 94
 ramuscula, 83, 84, 92
 rhodoides, 87, 88, 111
 rileyana, 83, 93, 94
 rosacea, 84, 97
 salicifolia, 86, 87, 106
 salicis, 82, 84, 85, 96
 sodalitatis, 82, 88
 strobiloides, 87, 112, 177, 179
 triticoides, 83, 85, 88
Rhizomyia, 81, 202
 absobrina, 203, 206
 cerasi, 203, 205
 cincta, 202, 204
 fraxinifolia, 202, 203
 hirta, 203, 208
 hispida, 203, 205
 perplexa, 202
 unguata, 202, 204
 vitis, 203, 206
Rhodites gracilis, 48
 rhododendri, *Sesia*, 9, 19
Rhododendron, pitted *Ambrosia*
 beetle injuring, 36, 38
Rhododendron clear-wing, 9, 19
 rhodoides, *Rhabdophaga*, 87, 88, 111

rhodophaga, *Dasyneura*, 9, 117, 130
 rhois, *Dasyneura*, 120, 146
Rhopalomyia, 208
 tridentatae, 209
 rigidae, *Phytophaga*, 88
 rileyana, *Rhabdophaga*, 83, 93, 94
 rileyi, *Batrachedra*, 16
Riveraella, 80
Robinia pseudoacacia, 164
 robiniae, *Cyllene*, 62
 rosacea, *Rhabdophaga*, 84, 97
 rosae, *Typhlocyba*, 70
 rosarum, *Dasyneura*, 125, 166
 Rose, galls on, 97, 130, 166
 Rose gall, 48
 Rose leaf hopper, 70
 Rose midge, 9
 rubiflorae, *Dasyneura*, 118, 119, 138
Rubus sp., 138
 rufipedalis, *Dasyneura*, 128, 181

Sackenomyia packardi, 109

viburnifolia, 201
 Sage bush, galls on, 209
 salicifolia, *Dasyneura*, 126, 128, 169
Rhabdophaga, 86, 87, 106
 salicis, *Rhabdophaga*, 82, 84, 85, 96
Salix, forest tent caterpillar injuring,
 61
 galls on
 bud galls, 88, 94, 97, 100, 103, 164,
 177
 leaf galls, 93, 111, 169
 pine cone galls, 179
 twig galls, 88, 90, 91, 92, 96, 100,
 103, 105, 109, 110, 112, 113, 168
 saltatorius, *Neuroterus*, 68
 San José scale, 6, 53, 69, 70
Sarcophaga georgina, 71
Sassafras, pitted *Ambrosia* beetle
 injuring, 38
 saucia, *Agrotis*, 56
Scheuria, 81
Schizomyia pomum, 108
 schwarzi, *Lasiapteryx*, 190, 193
 scrupeus, *Paracalocoris*, 6, 41
 scutata, *Dasyneura*, 124, 158
 Sedge, galls on, 153
Seius sp., 71
 semenivora, *Dasyneura*, 126, 127, 166

- serrulatae*, *Dasyneura*, 130, 186
Sesia rhododendri, 9, 19
setosa, *Dasyneura*, 119, 141
 Shade tree insects, 7, 56
signata *var.* *binotata*, *Hyperaspis*, 59
similis, *Dasyneura*, 124, 160
simulator, *Dasyneura*, 120, 142
Siphonaptera, additions to collection, 74
sisymbrii, *Dasyneura*, 116
Sitodrepa panicea, 64
 Slippery elm gall, 58
smilacifolia, *Dasyneura*, 121, 122, 147
Smilacina racemosa, 155
smilacinae, *Dasyneura*, 122, 123, 155
Smilax, galls on, 147
sodalitatis, *Rhabdophaga*, 82, 88
Solidago, galls on, 132, 134, 148, 158, 178, 183, 184, 199
 Solomon seal, false, galls on, 155
Spathius trifasciatus, 29
speciosa, *Astrodiplosis*, 71
Spiraea, galls on, 106, 107, 135
spiraeina, *Dasyneura*, 117, 135
spiritus, *Anagrus*, 187
 Spotted hemlock borer, 8, 26
Spruce, galls on, 136, 162, 165
 injurious insects:
 spruce bud moth, 49
 spruce bud scale, 59
Spruce aphid, 64
Spruce bud moth, 49
Spruce bud scale, 59
Spruce gall aphid, 48, 59
stipata, *Hadena*, 14
striaticornis, *Polynema*, 89, 176
strobi, *Pissodes*, 8, 30
strobiloides, *Rhabdophaga*, 87, 112, 177
studiosa, *Eurytoma*, 110
Sulphur, 69

Telenomus podisi, 176
Tetraneura ulmisacculi, 57
Tetrastichus carinatus, 176
Thecodiplosis ananassi, 68
 dulichii, 68
 Thistle, galls on, 160
thuiella, *Argyresthia*, 22

thujaella, *recurvaria*, 23
Thysanoptera, additions to collection, 77
Thysanura, additions to collection, 78
Tinea granella, 7, 16
 variata, 16
Tiphia inornata, 24
 Tobacco extract, 44, 51, 52, 70
Tortrix fumiferana, 49
Torymus ostensackenii, 106, 187
Toumeyella liriodendri, 8, 60
toweri, *Dasyneura*, 130, 187
Trichoperrisia, 80
tridens, *Neptunimyia*, 68
tridentatae, *Rhopalomyia*, 209
trifasciatus, *Spathius*, 29
trifolii, *Dasyneura*, 120, 121, 122, 143
Trifolium pratense, 99, 143
 repens, 143
triphleps insidiosus, 176
tristis, *Lachnosterna*, 25
tristissima, *Gnophomyia*, 49
triticoides, *Rhabdophaga*, 83, 85, 88
tsugae, *Camptomyia*, 29, 71
 Tulip tree scale, 8, 60
tumidosae, *Dasyneura*, 123, 155
 Two-lined chestnut borer, 9
 Two-spotted lady beetle, 53, 68
Typhlocyba rosae, 70

ulmea, *Dasyneura*, 127, 171
ulmi, *Phytophaga*, 68
ulmicola, *Colopha*, 58
ulmifusus, *Pemphigus*, 58
ulmisacculi, *Tetraneura*, 57
unguicula, *Dasyneura*, 119, 141
ungulata, *Rhizomyia*, 202, 204
urticae, *Dasyneura*, 116

Vaccinium canadense, 145
vaccinii, *Cecidomyia*, 151
 Dasyneura, 121, 122, 150
 variata, *Tinea*, 16
 Variegated cutworm, 56
vernalis, *Dasyneura*, 117, 132
viburnifolia, *Cystiphora*, 201
Viburnum ? *lentago*, 201
viminalis, *Cecidomyia*, 82
Viola dicksonii, 166
Virginia creeper, galls on, 140, 161

- virginiana, *Dasyneura*, 207
- Virgins bower, galls on, 147
- Visual Instruction Division, cooperation with, 11
- vitis, *Dasyneura*, 117, 134
 - Lasioptera*, 134, 206
 - Rhizomyia*, 203, 206
- Vitis* *sp.*, 134, 206
- Water-beech**, pitted Ambrosia beetle injuring, 38
- watsoni, *Ctenodactylomyia*, 208
- Webworms, grass, 15
- Whale oil soap solution, 53
- White grubs, 24, 70
- White pine weevil, 8, 30
- White-winged *Bibio*, 66
- Willow, *see* *Salix*
- Winnertzia aceris, 71
- Wolf moth, European, 16
- Xylonomus** insularis, 29
- Xyloperrisia, 80
- Yucca** angustifolia, 140
- yuccae, *Dasyneura*, 119, 140

ERRATA

- Page 66, line 10, for **Leucopsis**, read **Leucospis**
- Page 129, line 6, from bottom, for **melilotii**, read **meliloti**
- Page 132, line 25, for **Baldratia**, read **Asteromyia**





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